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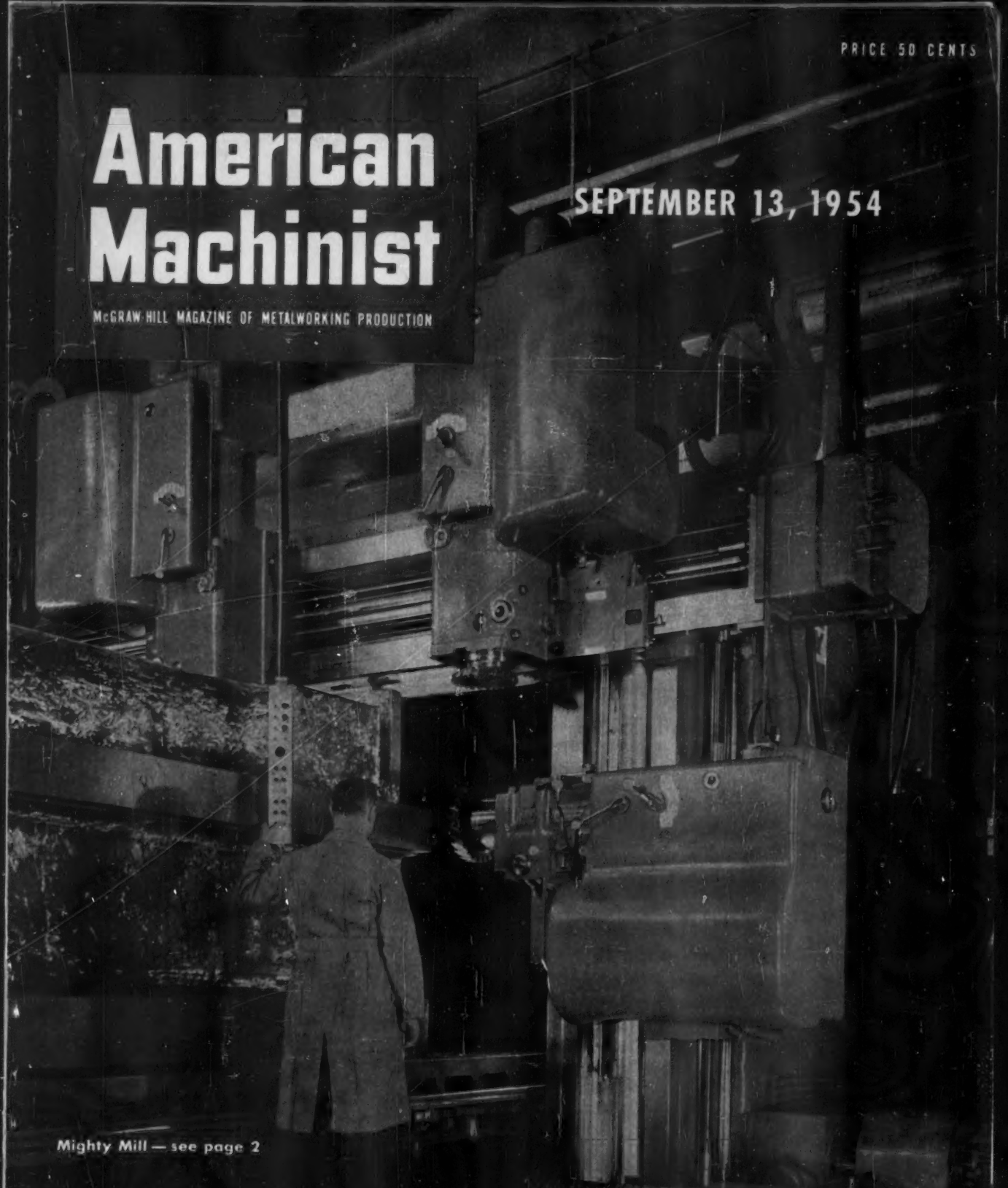
American Machinist

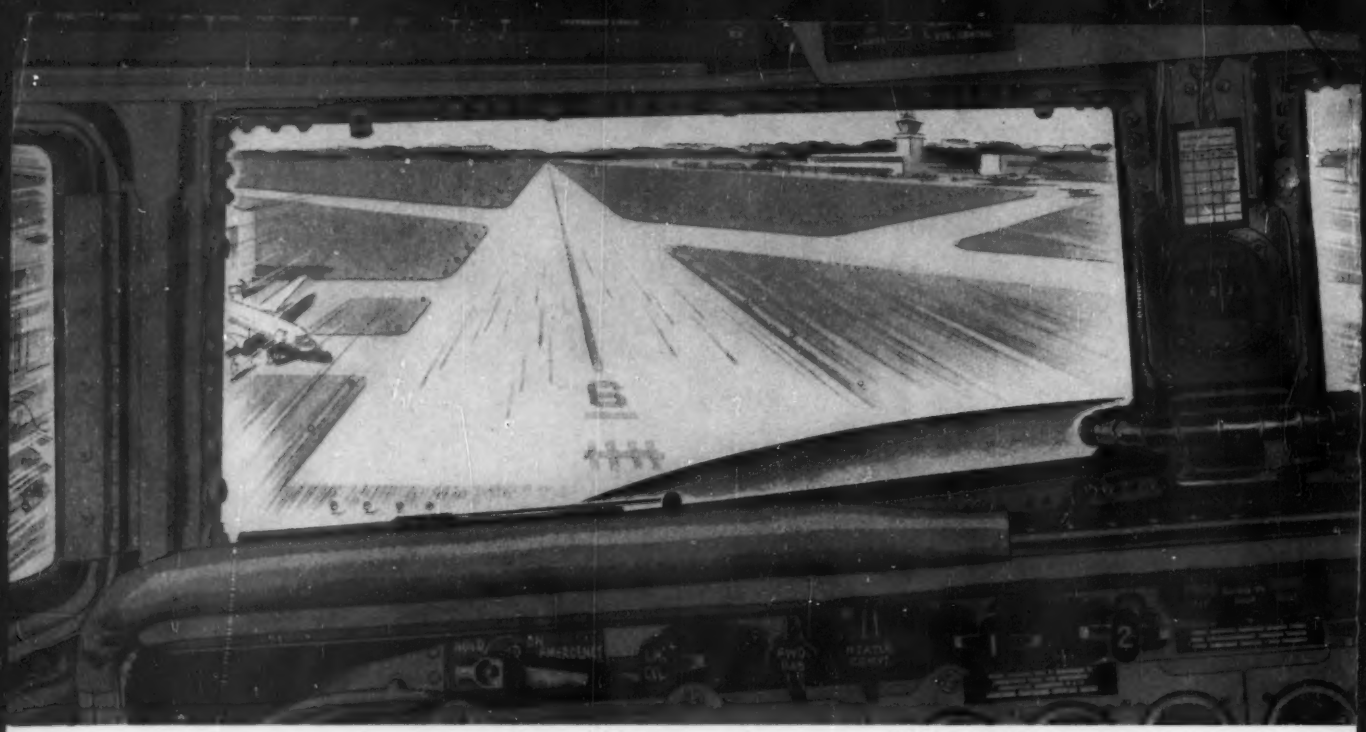
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

SEPTEMBER 13, 1954



Mighty Mill — see page 2

Two Special Reports: ANNEALING AND HOT WORKING • DIES FOR MICA



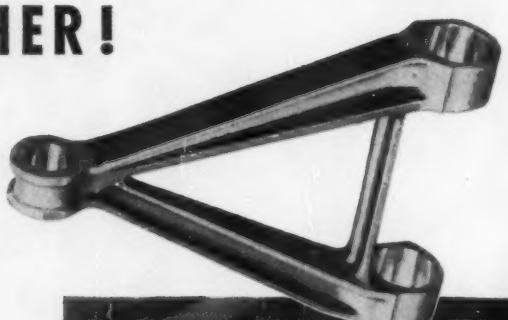
DOWN LIKE A FEATHER!

. . . a little safer, a little smoother because this part was BORIZED*

You're heading for the runway on final approach — fifty tons of airliner hurtling through space at over 100 miles an hour, yet settling to the earth as lightly as a feather. This is the time when a lot of things must work *just right*.

That they do so, thousands of times a day at airports the world over is a real tribute to the aviation industry. Such performance is made possible only through the utmost precision in every step of manufacture. That's why so many parts of the modern aircraft are borized. Here, for example, is a torque arm for a landing gear, borized on a Heald Model 422 Bore-Matic.

Whenever a part is borized, you can be sure of three things. A finer, longer-lasting, precision made part. Important savings in time and production cost. A definite competitive advantage for your product. That's why IT PAYS TO COME TO HEALD.



This Model 422, is used to bore, counterbore and chamfer seven different torque arms for landing gear components. Aligning rails on both the boringhead bridges and the fixture sub-base aid in accommodating the various parts.

Basic fixture equipment consists of angle plate type with swinging gate locator and hand cam clamps — gate locator is interlocked so that machine will not operate unless part is correctly located.

* *Precision finished by a Heald-engineered method on a Heald Bore-Matic.*

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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ABC ABP

chips

HIGH-SPEED MONSTER . . . Shown on our cover is a new 84-in. x 84-in. x 24-ft heavy-duty, double-housing planer-type miller that G A Gray built for its own use — the final and largest unit in that company's "elephant tool program." It does high-speed carbide milling — is shown working on an 8-in. horizontal boring, drilling and milling machine column.

TI, YET AGAIN . . . Requests from readers for "more data on titanium" are answered further in this issue with two articles, one a 5-page summary of latest production techniques on forming and milling from Republic Aviation, the other giving best machining data on Ti-stainless by George Glaeser of Gillmor Engrg . . . The first article covers rubber forming, stretch press, brake, die materials, drop hammer, furnace and resistance heating, contour rolling, and milling.

MICA . . . Mica is a difficult material to fabricate anyhow, but is in wide use for hundreds of tiny electronic parts. So Associate Editor Wright has made an exhaustive study of the dies required and how they're made. Our current 16-page Special Report gives his findings at Schneider & Marquard, leading die producers. Here's a triple-barreled story, covering mica, intricate diemaking, and a crackerjack apprentice setup. Copiously illustrated, it will, as usual, be available in reprint form.

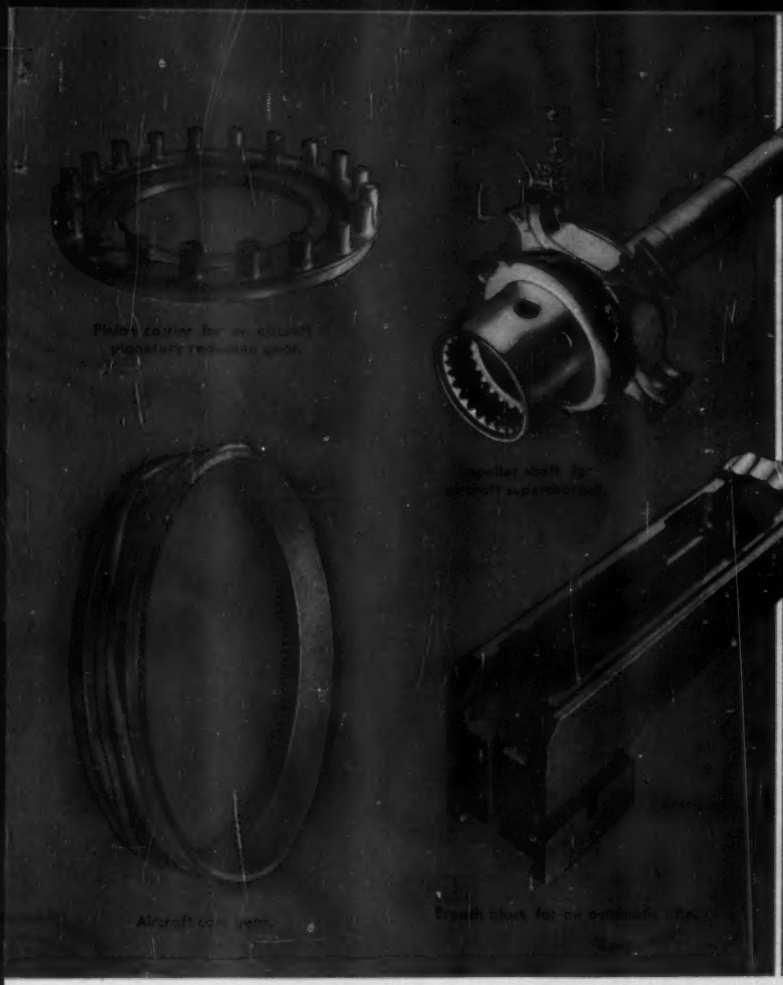
HOT WORKING . . . Close on the heels of his shop-metallurgical report on cold working, Sam Storchheim comes up with an 8-page Special Report on annealing and hot working. That gives you the package of metallurgical reasons for why metals act as they do.

TOOLING . . . This issue is full of tooling data—on titanium, Ti-stainless, mica, a further instalment of Cope, and the like. There are also a group of Shop Shots from four aircraft plants (Temco, Boeing, Convair, Northrup), a spread of pictures showing four examples of the use of air control on drills, and two singles worthy of note. First, there's a page showing how Boeing got $9200 worth of parts for $1408 —by buying up used pinball machines. . . . Then there's a page on air-line mufflers that cut noise 75%, air use 25%.

SCHEDULES . . . Ward A Ring, vice-president of Woodward Governor Co, Rockford, Ill, tells in four pages how conveyors and phones at machines simplify and speed scheduling and work flow. . . . Also for thinking management is a spread showing how Amco Gage Co, Detroit, uses a simple system to streamline its job-shop operations. Only three forms are used. . . . Then, too, there's another spread, from Des Moines, Iowa, that shows how safety can pay off.

COMING . . . Sept 27 *AM* will include a Special Report on fabricating all forms of stainless based on data from all producers, plus articles on the standard minute in the toolroom, dies for plastics, welding of tubular parts, and several other subjects.

GEAR MAN . . . Oliver Saari was born in Helsinki, Finland; came here with his parents in 1927. Now 36, he has his BSME from the U of Minn, did two years of tool design at Buick — and got interested in gears. That led to 3 years at Illinois Tool, on design and research, then a job at Toro Power Mower, a couple of years at Minneapolis-Honeywell (both in Minneapolis), and back to Illinois Tool in 1950. Now he is working on new products development, has several patents pending, has done some graduate work in math, is married . . . and has been writing articles for you. His latest, on exact wheel profiles for form grinding—of gears, of course—is in this issue.



The Gleason No. 26 Quenching Press for parts up to 25" in the maximum dimensions.

The Gleason No. 140 Quench Machine for shafts and similar parts 1⅛" to 4" in diameter, up to 43" in length.

How to hold parts like these to close tolerances during quenching

Are you troubled by warpage or distortion of precision parts during hardening?

If you have this problem, Gleason Quenching Equipment can help solve it with substantial savings in costs.

This equipment provides automatic, controlled quenching of flat, round, irregular, or shafted parts insuring alignment and minimizing distortion.

For round, flat or irregular parts up to 36" in the maximum dimension there are three sizes of Gleason Quenching Presses of the type shown at the top right.

For shafts or similar parts there is the Gleason Rolling Quench Machine, shown at lower right. It accommodates shafts from $\frac{9}{16}$" to 4" in diameter, from 6" to 43" in length, and can handle parts with integral cams, gears or shoulders up to 8" in diameter.

In all these machines the heated part is held under pressure. Flow of the quenching fluid to each portion of the heated part is accurately controlled at preset rates during all stages of the quenching cycle.

In the Quenching Presses precision dies hold the part in alignment and direct the flow of quenching medium during the quenching cycle. In the Rolling Quench Machine the part is rolled under controlled pressure. Relative pressures applied to the various portions of the part are accurately and automatically controlled.

The use of Gleason Quenching Equipment eliminates the need for any subsequent straightening. This is important for two reasons: (1) It saves one operation, reducing production costs. (2) Hardened parts which do not require straightening have less residual stress. Further information will gladly be sent on request.

GLEASON WORKS

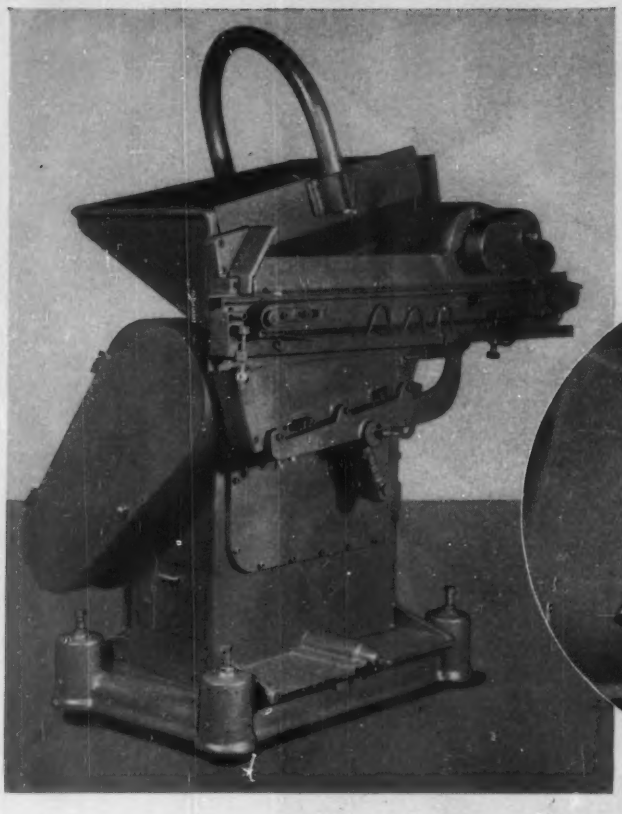
Builders of bevel gear machinery for over 85 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

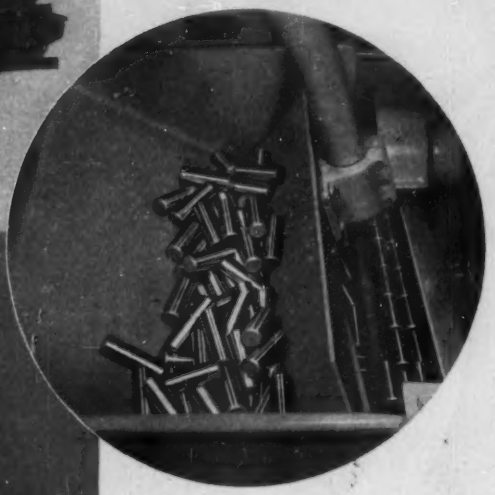
See these machines in Booth 454

AT THE NATIONAL METAL EXPOSITION

Chicago November 1-5, 1954



Type E Feedmatic Hopper, for thrufeed work. Capacity: work diameter, min. ¼", max. 1½" . . . length, min. ½", max. 18" . . . motor drive ½ hp.



Have you ever handled thousands of parts in the course of a brief machining operation? Even though you haven't, you can readily imagine what an onerous job it is for the operator. And it's expensive, too. Feedmatic Hoppers for CINCINNATI FILMATIC Centerless Grinders eliminate tiring and expensive handling of the work. The operator devotes his time to quality, and the Hopper handles the quantity. Another advantage: it's not necessary to have continuous production of a single part; you can handle a number of long runs of similar parts with the same Hopper. ¶ There are two styles of Feedmatic Hoppers . . . Type B for infeed work, and Type E for thrufeed work. Both styles can be applied to CINCINNATI FILMATIC Nos. 2 and 3 Centerless Grinders. Brief data on these precision grinding machines and Feedmatic Hoppers will be found in Sweet's Catalog File. Complete information may be obtained by writing for the following literature: CINCINNATI FILMATIC No. 2 Centerless Grinding Machine, Catalog No. G-611-1; CINCINNATI FILMATIC No. 3 Centerless Grinding Machine, Catalog No. G-570-3; Feedmatic Hopper, Catalog No. G-575-2.

CINCINNATI GRINDERS INCORPORATED

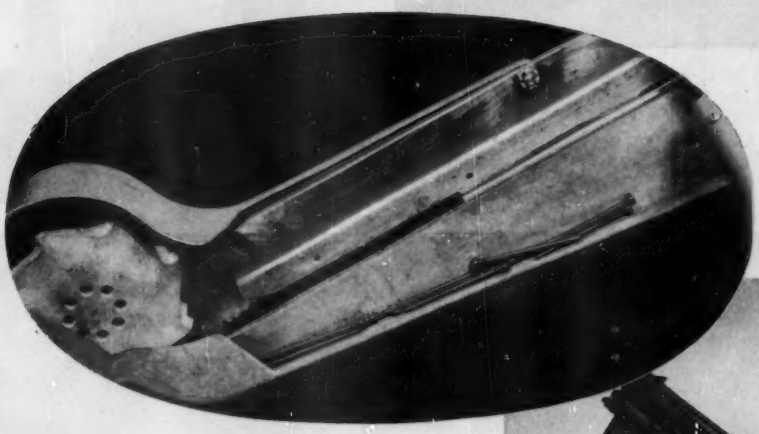
Subsidiary of The Cincinnati Milling Machine Co.

CINCINNATI 9, OHIO

CINCIN

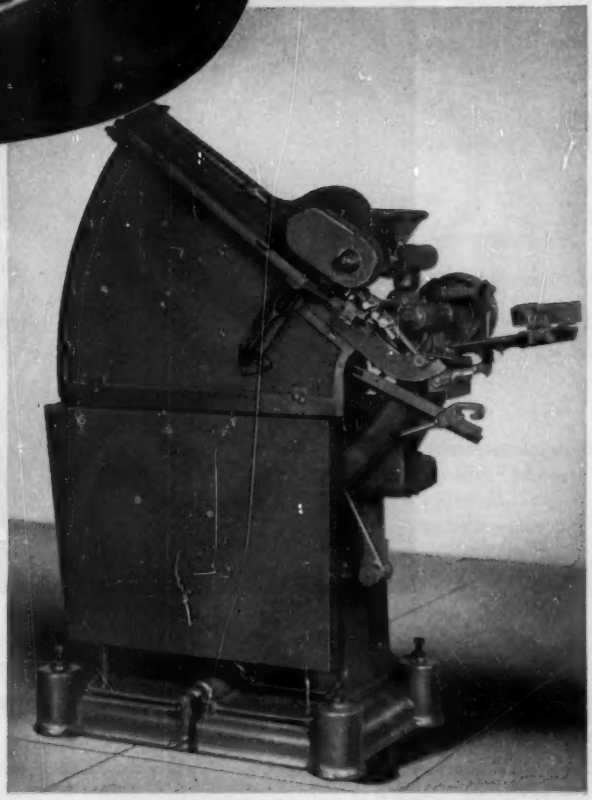
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES •

Quick Way to Mechanized Handling of Centerless Ground Work



Type B Feedmatic Hopper, for infeed work. Capacity: work diameter, min. stem ⅛", max. stem 1½"; min. head ¼", max. head 2" . . . length under head, min. 1½", max. 8" . . . motor drive ½ hp.

Catalog No. G-575-2 contains complete details about Feedmatic Hoppers for use on CINCINNATI FILMATIC Nos. 2 and 3 Centerless Grinding Machines. Write for a copy.



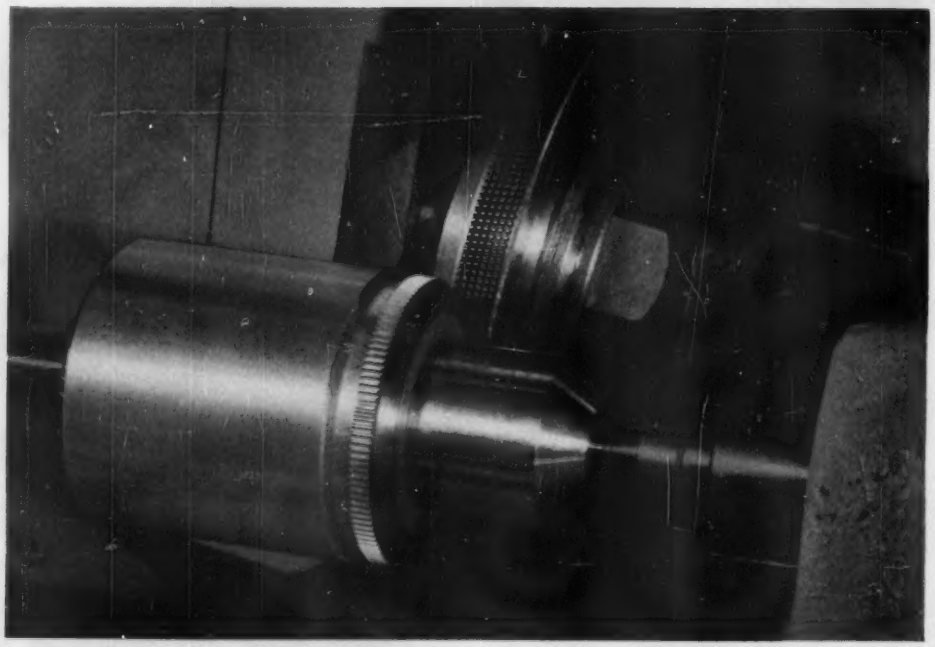
NATI

CINCINNATI

MICRO-CENTRIC GRINDING MACHINES

Rough and finish cut on
Fellows 7-Type Gear Shaper

Finishing on a Fellows No. 4
Fine-Pitch Shaving Machine



THE Fellows

ELECTRO-MECHANICAL ACCURACIES TO *6 Minutes of Arc*

1/3600 variation in the relative rotative motion between a Ketay Synchro and its paired Servo device involves manufacturing controls and shop skills of a high order. As typical of its gear cutting, Ketay Manufacturing Corporation, 555 Broadway, New York 12, quotes the following 'specs' for the Synchro housing shown:

- 96 teeth, 72 pitch, 1.3333″ pitch dia., 20° pressure angle, integral on housing of #303 stainless
- Inspection limits: .0005″ on runout, .0002″ on pitch diameter
- All cut and shaved on Fellows machines; 'Red Liner' inspected

Ketay, a major supplier of synchros, servo motors, resolvers, and precision electro-mechanical devices to leading manufacturers of automatic controls, relies on Fellows gear cutting to supply plants on the East and West Coast.

Whether fine-pitch gears for electronic instruments, or load carrying gears for machines, precision quality and cost economy are well served by the Fellows Method. Ask the nearest sales office for specific information.

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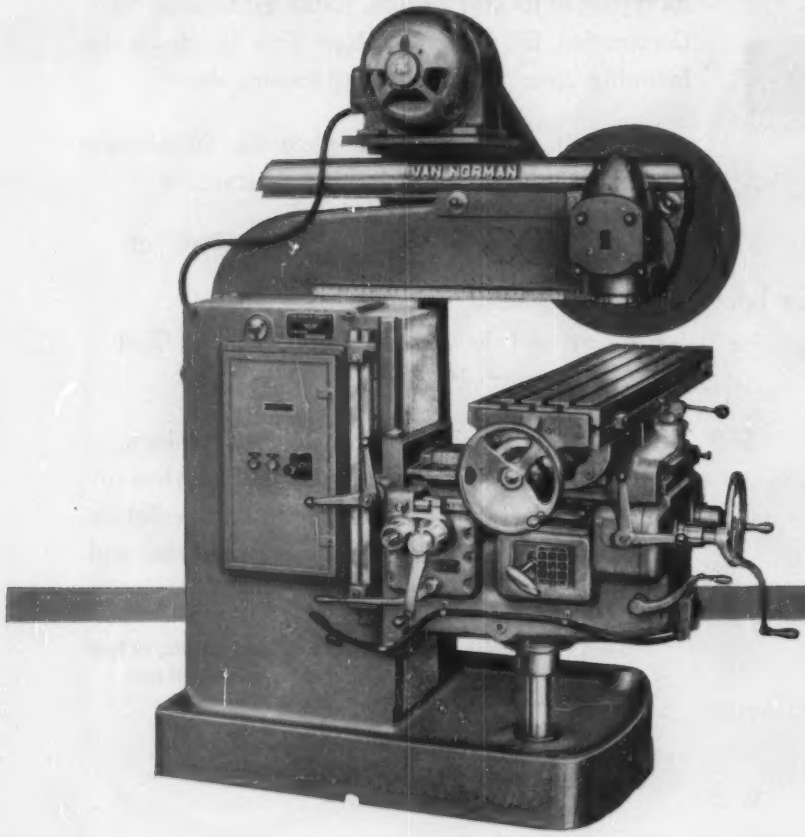
...EVERY

Van Norman Ram Type Miller

Gives You EXTRA "CUT-ABILITY"

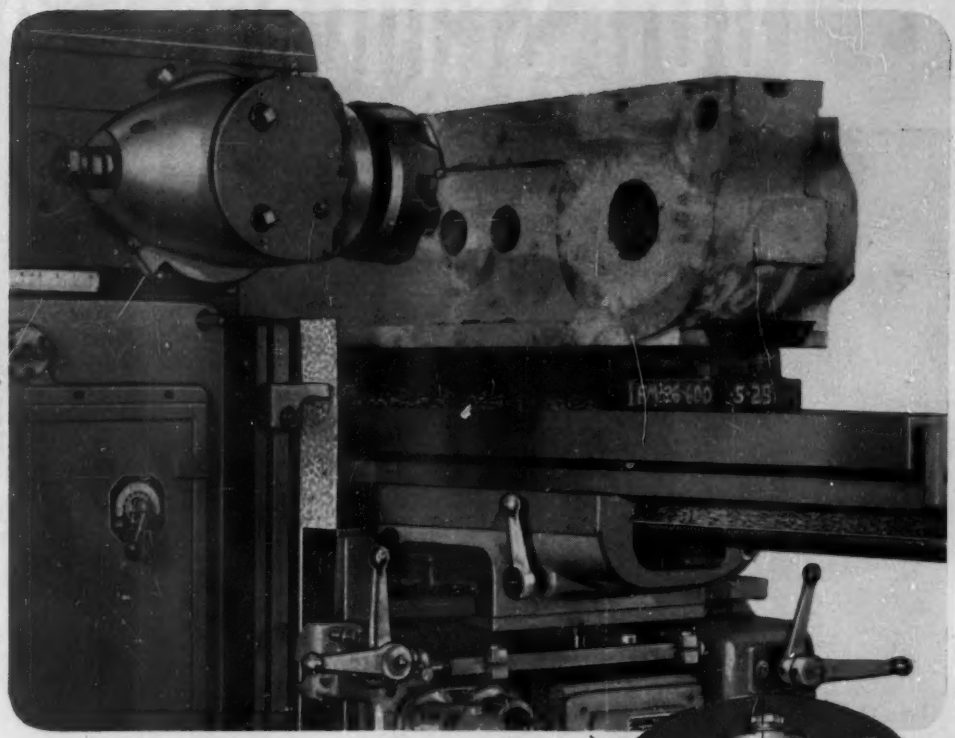
that INCREASES Production



No. 38-M Ram Type Miller
Table: 64" x 14"
Cutterhead Spindle Motor: 10 H.P.
Feed Motor: 1½ H.P.
Ram Movement: 29"
18 Feeds; 12 Speeds

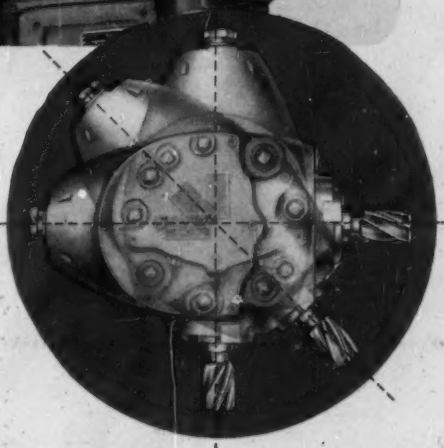
VAN NORMAN

MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



You simply can't beat the new Van Norman Ram Type Millers for "Cut-Ability". The powerful spindle motors drive the cutterhead only... provide ample power for every milling cut with all types of cutters including *carbide cutters.* The extra heavy movable rams plus larger, heavier column, base and knee, saddle and table assemblies provide maximum rigidity.

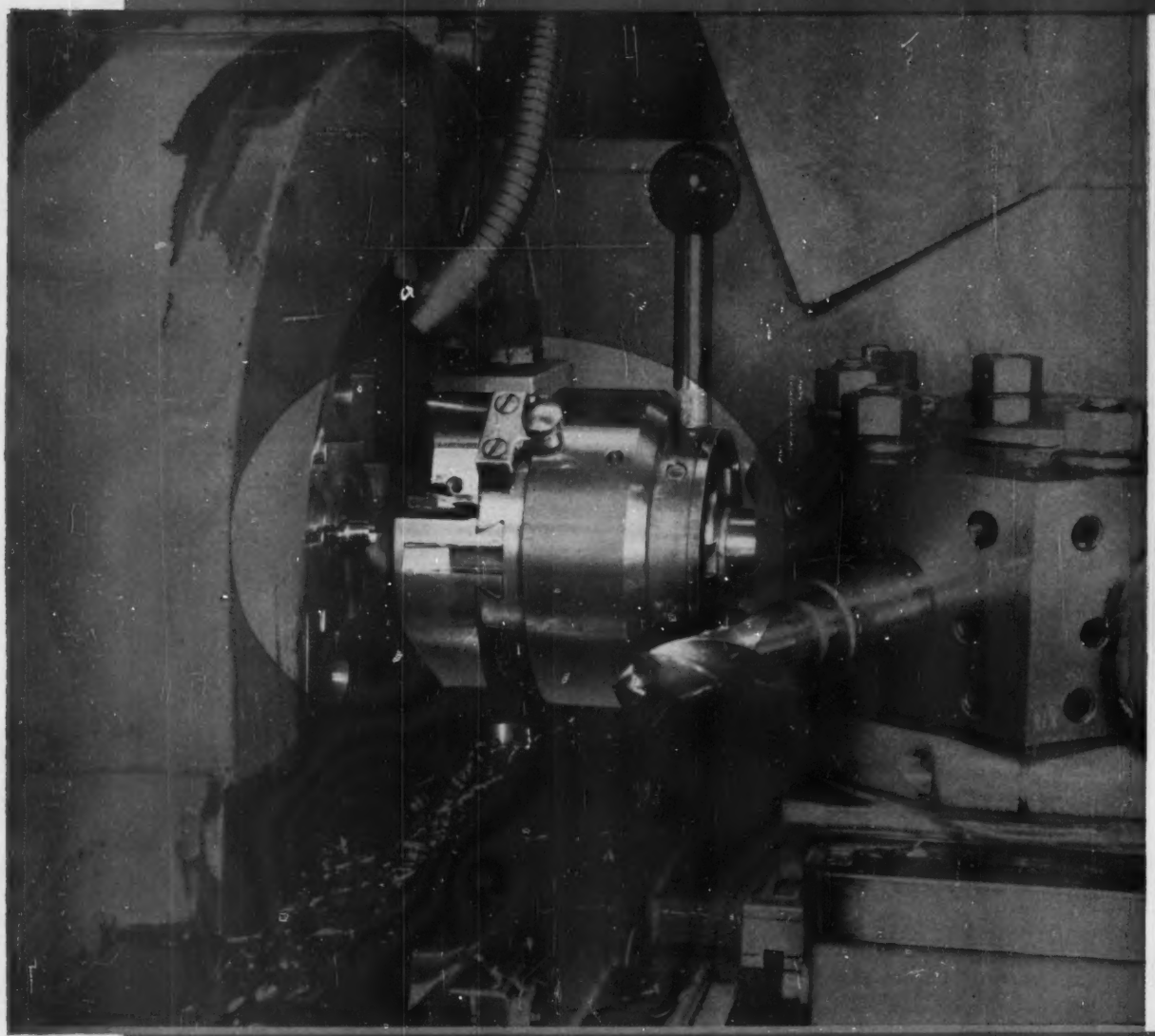
Find out how you can increase production, cut milling costs with the new modern Van Norman Ram Type Millers. Write:



Plus **Maximum "FLEX-ABILITY" with the adjustable cutterhead.**

COMPANY SPRINGFIELD 7, MASSACHUSETTS

1800 Stainless Steel



LANDIS *Machine* COMPANY

WAYNESBORO · PENNSYLVANIA · U. S. A.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

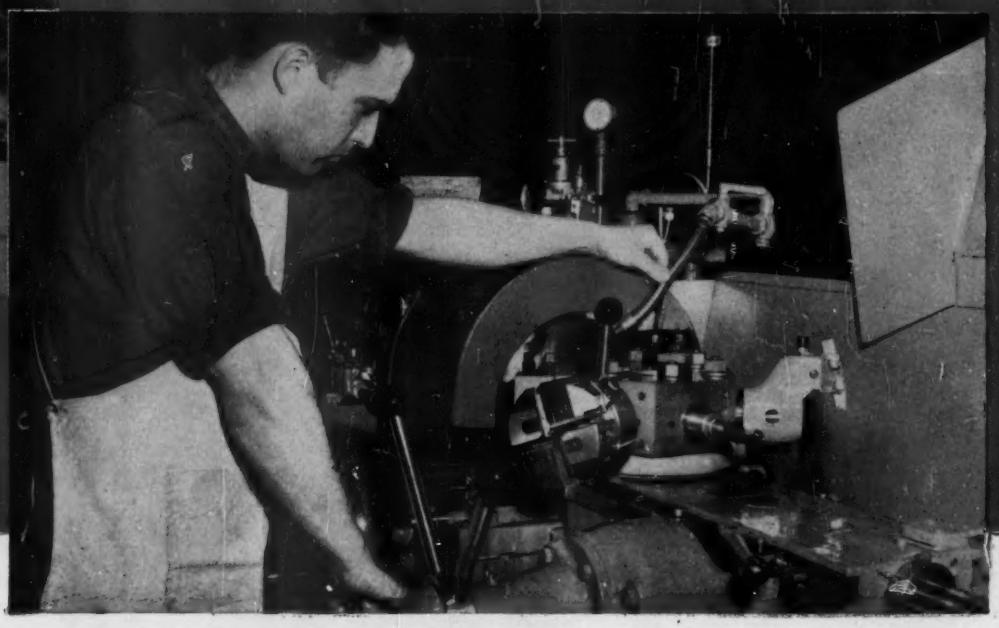
Threads Per Chaser Grind

LANDMATIC HEADS are every day saving production dollars for the Crawford Fittings Company of Cleveland by low tool cost and minimum machine downtime.

This company manufactures Swagelok Tube Fittings ranging from ⅛" to 1" in diameter. These fittings are produced from stainless steel tees of austenitic type 316 cold-worked to a Brinell hardness of 250. In producing the 7/16" fitting, for example, (as illustrated) 20-pitch straight UN threads are cut close to the shoulder 5/16" long to Class 3 fit.

LANDMATIC Hardened and Ground Heads, such as used by Crawford, are designed to produce threads to Class 3 or 4 fit in all types of tough materials. Unusually heavy construction and sound fundamental die head design assure the rigidity necessary for accurate threads. The inherent features of the design of the Landis Tangential Chasers and their proper manufacture and hardening, developed during 50 years of threading experience, ensure long chaser life and low threading cost.

If you require threads on stainless steel or other tough material, LANDMATIC Hardened and Ground Heads offer you these same cost-saving features. Please send specifications and write for Bulletin F-80 for additional information.



Automatic Grinding Gives High Output...

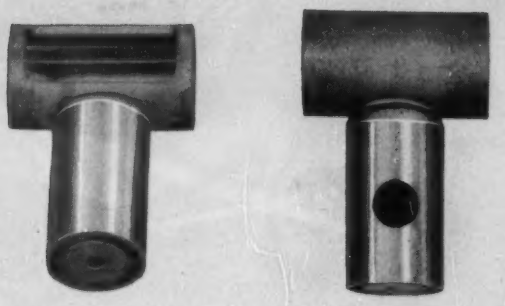
Grinds 380 pistons per hour

Improved Landis No. 12 Centerless Grinder with automatic hydraulic infeed, power-operated loader and spark-out timer. Perhaps a loader of this type could be applied to your work to reduce costs. Send us your data for production estimates.

LANDIS

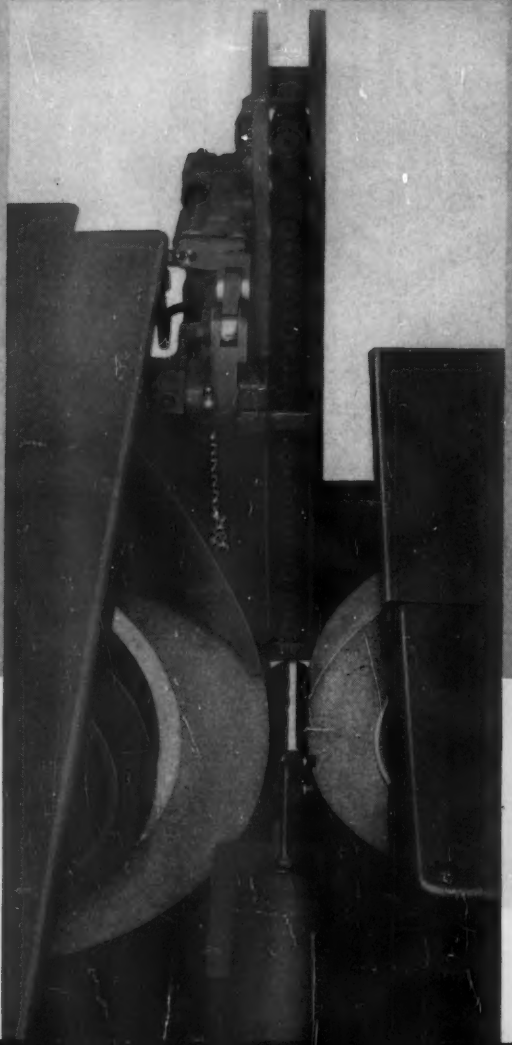
precision grinders

...Low Unit Costs



- Power-operated loader feeds pistons . . . operator stacks work in feed chute.
- Hydraulic infeed automatically feeds grinding wheel to finish size. Retracts for automatic loading.
- Timer controls spark-out period.

loads and grinds automatically



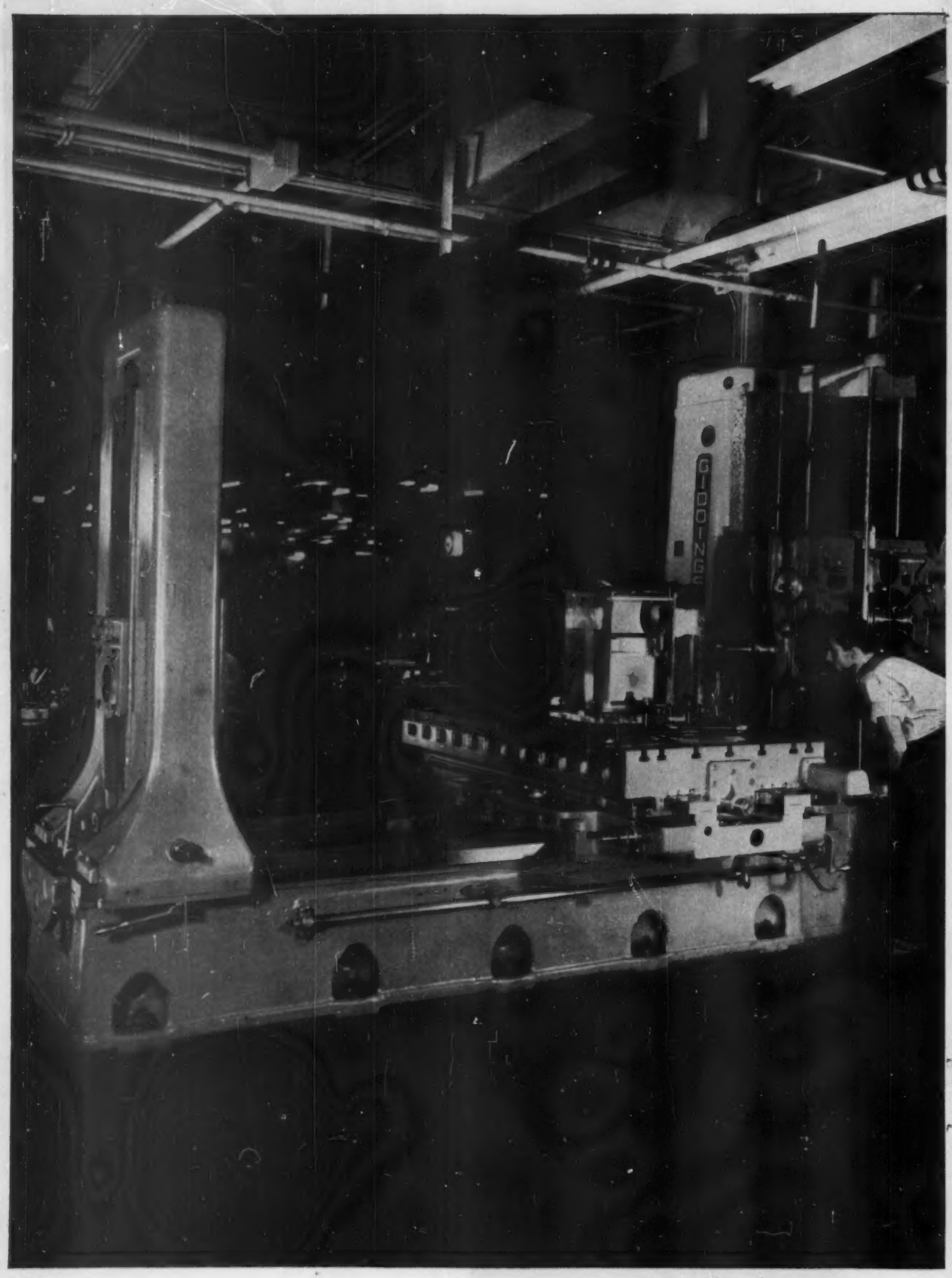
unloads automatically

- Power-operated loader swings back.
- Work piece is ejected onto discharge chute.

Semi-finish grinds 380 piston assemblies per hour. Stock removal: .005" to .007"

LANDIS TOOL COMPANY

WAYNESBORO, PENNA., U. S. A.


GIDDINGS

Pace-setter...

often copied, never equaled

This G&L 340-T Horizontal Boring, Drilling and Milling Machine . . . like all G&L tools . . . is highly versatile, superbly built. And it's years ahead of its time in design

Compare horizontal boring machines feature by feature, advantage by advantage. Study the quality of their construction, the basic components and accessories or attachments available. You'll soon discover why the table type G&L 340-T is unmatched in its class for capacity, versatility and long-lived precision.

From its 4" dia. spindle to its simplified gear change and direct-reading dials—the 340-T's advanced design gives you 45 faster, easier speed selections from 10 to 1300 rpm. You have the option of standard or built-in rotary tables in several sizes . . . standard or increased working lengths of bed or columns. Hardened and ground bed and saddle ways are standard.

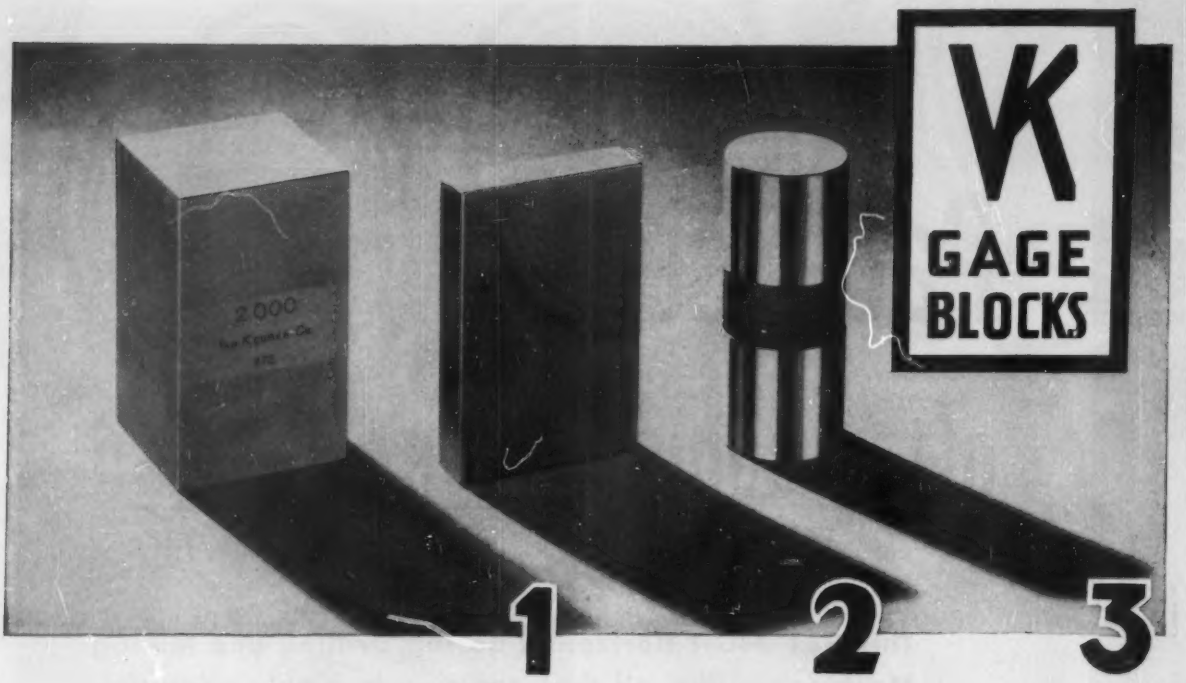
Further, the 340-T can be equipped with the G&L Automatic Electric Positioning device for simplification of close-tolerance sequence operations from a single setup. In fact, with a 340-T, you get the exact machine for your work — a machine that feature for feature, advantage for advantage cannot be matched.

For complete details on the 340-T or 350-T (5" dia. spindle) table type Horizontal Boring, Drilling and Milling Machines — contact your G&L representative or write for catalog No. 30-T.

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines; Vertical Boring Mills; and Davis Cutting Tools



THREE WAYS *to protect production accuracy*

To meet closest limits of accuracy and protect production, Van Keuren is currently furnishing three types of gage blocks:

1—SOLID SQUARE MASTER BLOCKS
2—RECTANGULAR REFERENCE GAGES
3—MICROGAGES

Shipment on complete sets of any of these three types can be made within 60 days from receipt of order.

VK Solid Square Master Blocks are accurate to .000004" per inch of length and are designed for laboratory use or to standardize all shop dimensions. Large wearing surface; perfect parallelism. Available in 85- and 41-block sets and guaranteed unconditionally for 5 years not to exceed .0001" in wear.

VK Rectangular Reference Gages are guaranteed accurate to .000008" per inch of length and are designed for this inspection department or precision setup work. They are available in 81-block and 33-block sets. Individual blocks from either of these sets can also be furnished. Certificate of size is also furnished with each set.

VK Microgages are accurate to plus .000012", minus .000008" per inch of length and are designed as working gages for shop use . . . to put accuracy at the machine. Wearing surface is 40% greater than that of rectangular gage blocks hence their long-wearing quality. Available in several set combinations.

Van Keuren Gage Blocks are fully described in Catalog and Handbook No. 35, yours for the asking by writing: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK

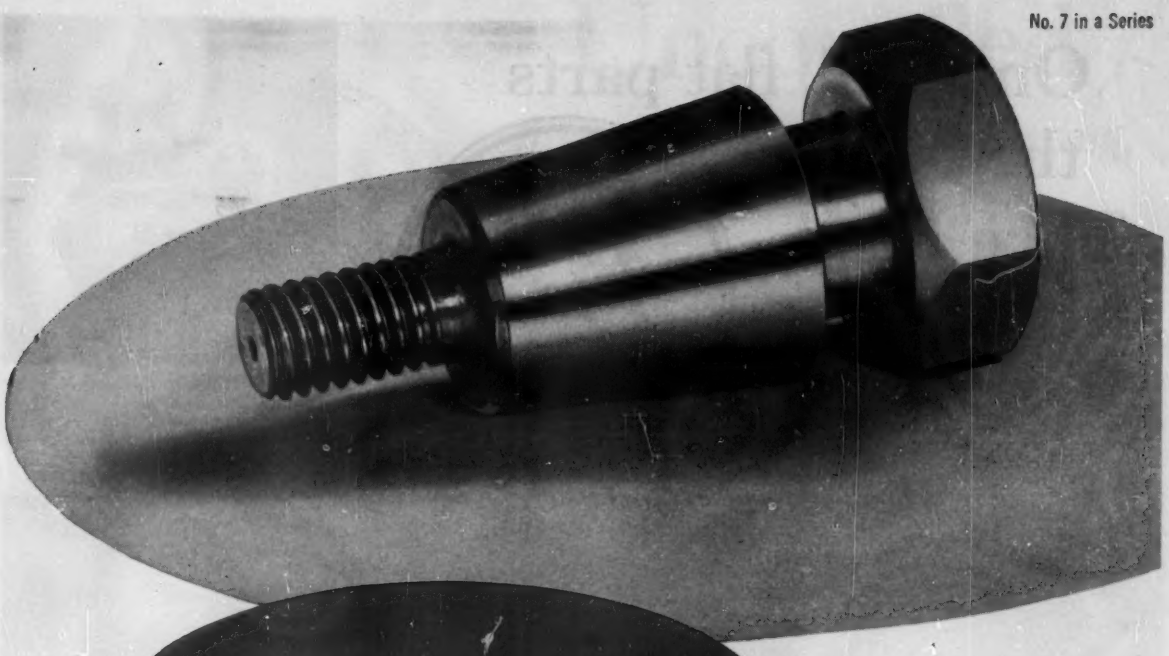
35th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

No. 7 in a Series



carbide service available

data for comparison

Part	Petcock Center
Machine	1⅝" Six Conomatic
Tools	100% Carbide Tipped
Material	X-1112
Stock Size	1" Hexagon
R. P. M.	1562
Time	8 seconds

Where conditions are favorable, 100% carbide tool-ups on "Automatics" make HSS tools appear as obsolete as ancient tools of carbon steel.

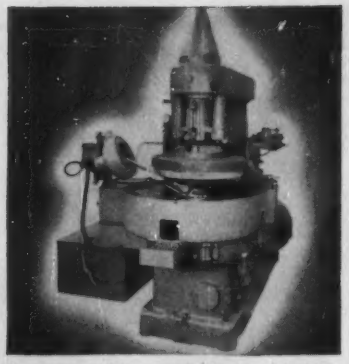
In determining the "favorable" conditions, the Conomatic Carbide Development is of real service to the "Automatic" user. Without risk of production loss or obligation of machine purchase, he gets an eye-witness demonstration of the profit possibilities of 100% carbide tooling to his own work.

Conomatic

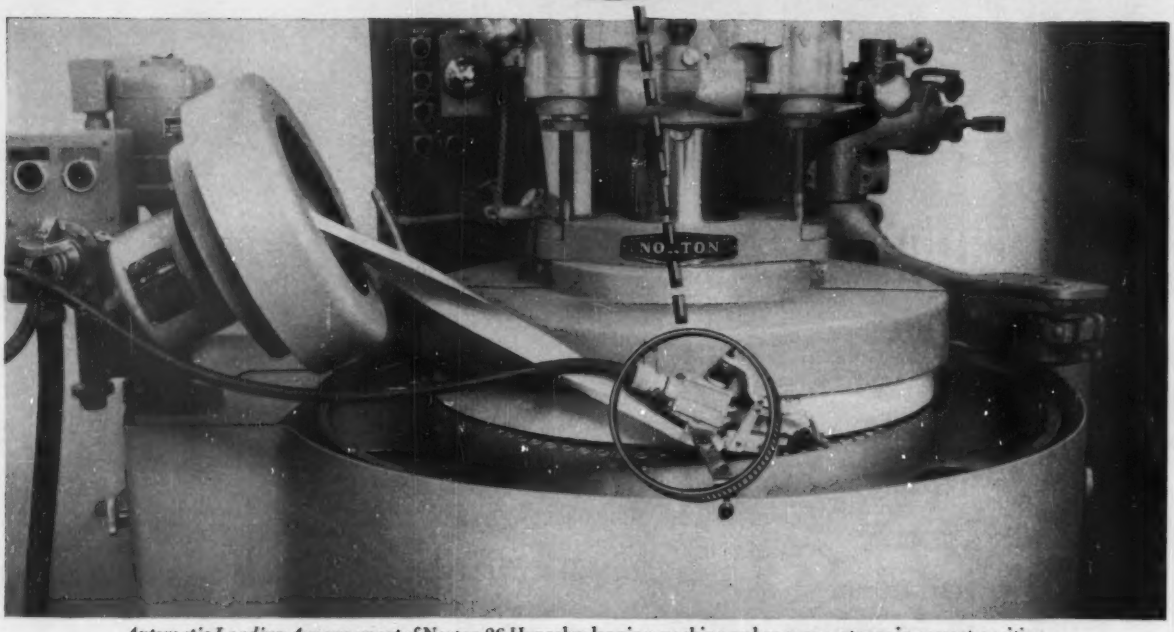
CONE AUTOMATIC
MACHINE COMPANY, INC
WINDSOR, VT., U.S.A.

On small, flat parts the Norton Thru-Feed Lapper

brings 4 to 1 savings



Norton 26 Hyprolap Lapping Machine with automatic loading features that increase production of small, flat parts difficult to handle manually as much as 4 to 1 . . . as many as 8000 pcs/hr.



Automatic Loading Arrangement of Norton 26 Hyprolap lapping machine makes sure parts are in correct position before entering feeding trough . . . prevents ganging up . . . directs work in a path that assures even lap wear.

*NEW, built-in automatic loading adds extra advantages to Norton 26 Hyprolap**

Now you can make 4-to-1 savings in lapping small parts . . . and get top-quality results on every job. Investigate new Norton 26 Hyprolap lapping machines with the exclusive built-in thru-feed mechanism.

Here's why:

1. You speed up production. Loading and lapping operations handle parts as fast as 8,000 pieces per hour.

2. You cut handling. Loading and unloading are completely automatic.

3. You reduce downtime. Work path traverses the entire working surface of each lap . . . promoting even wear . . . reducing the frequency of lap dressing.

4. You cut out operations. This lapper removes stock down to .0002" tolerances . . . makes surfaces parallel to .000025" . . . in many instances without pre-grinding of parts.

5. You use less skilled help. Filling feed hoppers and removing finished-work baskets are the only manual operations.

No wonder 4-to-1 savings are a matter of record with the new Norton Hyprolap with built-in automatic loading!

Send for Bulletin 852-7. Also submit samples of your work for production estimates. Standard hopper-feed Hyprolap machines take work up to 1¼" diameter. Modifications handle larger work. NORTON COMPANY, Machine Division, Worcester 6, Mass.

***To Economize, Modernize With* NEW**

NORTON

GRINDERS and LAPPERS

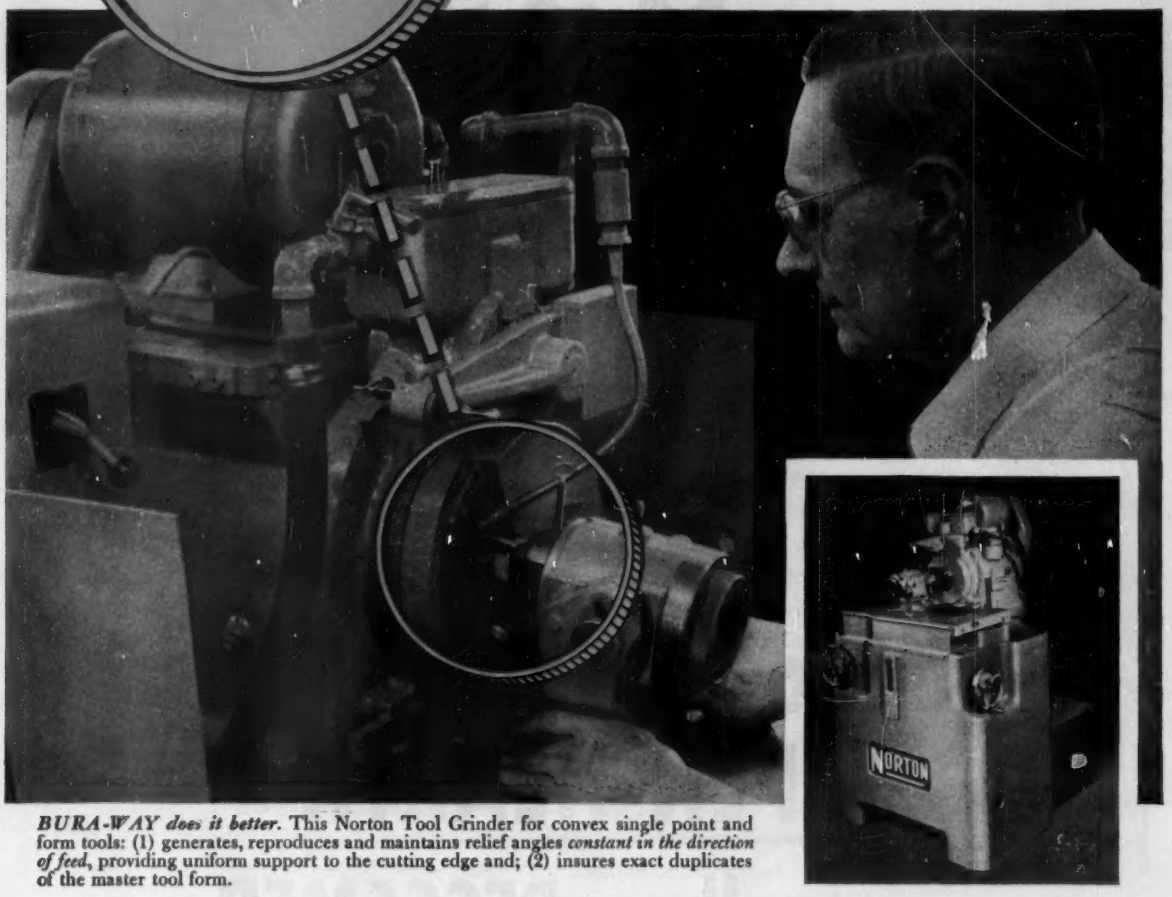
Making better products . . . to make other products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Unequalled

for carbide tool sharpening, the Norton No. 2 Bura-Way Grinder...

makes tools last longer



BURA-WAY does it better. This Norton Tool Grinder for convex single point and form tools: (1) generates, reproduces and maintains relief angles *constant in the direction of feed*, providing uniform support to the cutting edge and; (2) insures exact duplicates of the master tool form.

When your operator sharpens your carbide-tipped tools on the Norton No. 2 BURA-WAY Grinder he adds longer life value to these tools, helping you to make more profit and turn out better products for your customers.

Precise Duplicates Every Time

In the BURA-WAY No. 2 you have the ideal tool grinder. The BURA-WAY method increases tool life and gives you more pieces per sharpening. By exact duplication of the master tool, tremendous additional benefits may be realized from an effective tool control system and reduced set up time when changing tools.

Find Out More

Get in touch with your Norton representative whose knowledge and experience is further supplemented by Norton trained engineers. Only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost.

Write NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

District Sales Offices:
Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

Here's Good News for

U·S·S Free-Machining

MX

is now available in OPEN HEARTH as well as BESSEMER

screw machine operators

The fact has been amply demonstrated that you can produce more parts per hour, that you can prolong tool life, minimize rejections, readily hold to tolerances and obtain better part finish by using MX screw stock.

In the past three years, the hundreds of shops that have put this faster-cutting bar stock into production have proved that MX will reduce the cost of *any* part by out-performing ordinary screw stock.

Such cost savings have averaged between 10 and 15%, sometimes ran as high as 40%. Today, you can confidently count on still bigger savings by using this steel.

And make a note of this. Now MX is also being produced in our Open Hearths to give screw machine operators a freer-cutting steel of the C-12XX type. This steel, especially controlled to improve cold-drawing characteristics, assures users of a fast-cutting bar stock not only of *excellent* surface quality but one that performs exceptionally well when finish-machined parts must be subjected to crimping or other deforming operations.

U·S·S Free-Machining MX—either Open Hearth or Bessemer—is available in all the popular bar sections and sizes. You can obtain it in cold-finished form from your regular supplier as "MX" or under his own identifying trade name. In hot rolled form, MX is available direct through our nearest district sales office.

USS

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

RAM TYPE TURRET LATHES

NO. 2 ALL-GEARED HEAD
1" Bar Capacity
14" Swing

NO. 3 UNIVERSAL
1½" Bar Capacity
15⅜" Swing

NO. 4 UNIVERSAL
2" Bar Capacity
18⅛" Swing

NO. 5 UNIVERSAL
2½" Bar Capacity
20" Swing

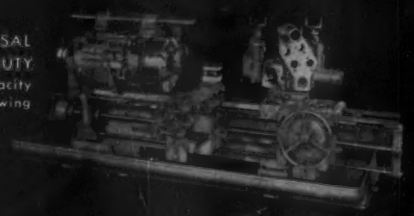
SADDLE TYPE TURRET LATHES

1-A UNIVERSAL
HEAVY DUTY
2⅛" or 3" Bar Capacity
16¼" Swing

2-A UNIVERSAL
HEAVY DUTY
3½" Bar Capacity
20" Swing

3-A UNIVERSAL
HEAVY DUTY
4½" or 6" Bar Capacity
23½" Swing

4-A UNIVERSAL
HEAVY DUTY
8" 9" or 12" Bar Capacity
28¼" Swing



PRECISION TAPPING AND THREADING MACHINES

NO. 10
TAPPING MACHINE
0-80 to 10-24 Capacity

NO. 11
TAPPING MACHINE
8-36 to 7/16" Capacity

NO. 11 RS RADIAL (Single Head)
NO. 11 RD RADIAL (Double Head)
8-36 to 7/16" Capacity

NO. 12
TAPPING MACHINE
1/4" to 2½" Capacity

MULTI-SPINDLE AUTOMATICS

6-SPINDLE BAR MACHINE
¾" or 1¼" Bar Capacity

5-SPINDLE
CHUCKING MACHINE
6" Swing

5-SPINDLE BAR MACHINE
1¾" Standard Bar Capacity
2¼" Oversize Capacity

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

SADDLE TYPE TURRET LATHES

1-A UNIVERSAL
EXTRA-HEAVY DUTY
2½" or 3" Bar Capacity
16¼" Swing

2-A UNIVERSAL
EXTRA-HEAVY DUTY
3½" or 4½" Bar Capacity
20" Swing

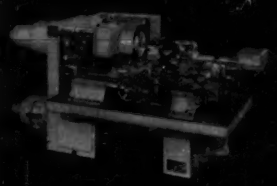
3-A UNIVERSAL
EXTRA-HEAVY DUTY
4½" or 6" Bar Capacity
23½" Swing

4-A UNIVERSAL
EXTRA-HEAVY DUTY
9" or 12" Bar Capacity
28¼" Swing

ELECTRO-CYCLES

NO. 1 ELECTRO-CYCLE
⅜" Bar Capacity
11" Swing

NO. 2 ELECTRO-CYCLE
1" Bar Capacity
14" Swing



NO. 3 ELECTRO-CYCLE
1½" Bar Capacity
15⅜" Swing

16" ELECTRO-CYCLE
1½" Bar Capacity
16⅞" Swing

SINGLE SPINDLE AUTOMATICS

1 AC CHUCKING MACHINE
8" or 10" Chuck — 6" Working Stroke

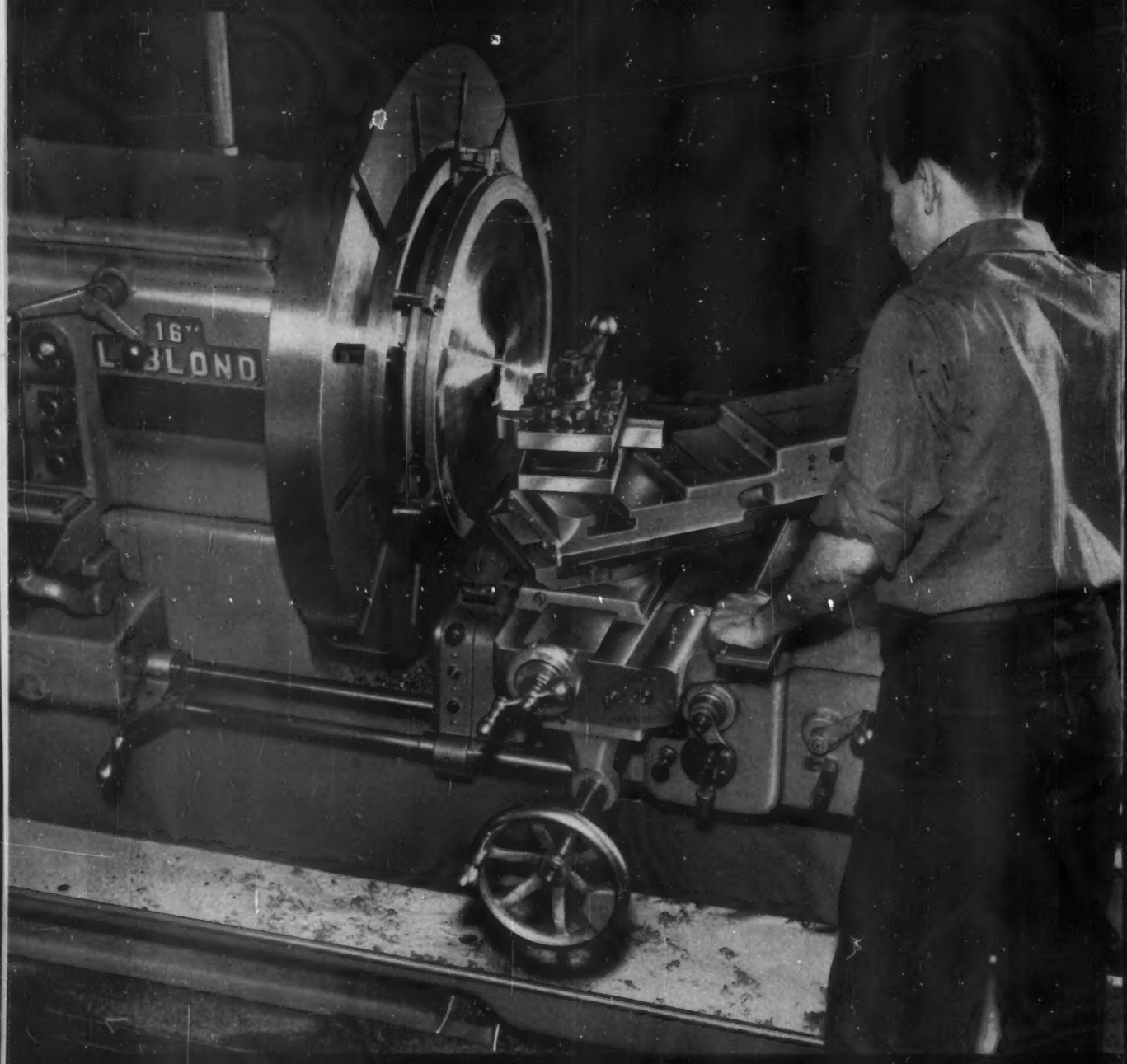
2 AC CHUCKING MACHINE
10" or 12" Chuck — 9" Working Stroke

When the going gets tough ...put it on a WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

"LeBlond Lathes help us



Turning Tough Titanium— A LeBlond 16"/38" Sliding Bed Gap Lathe with Hydra-Trace* performing the difficult job of contour facing a titanium forging. Columbia Machine Products likes the LeBlond for its smooth power, rigidity and versatility.

turn tough Titanium successfully"

...says *Columbia Machine Products, Brooklyn, N.Y.*

Turning titanium is tough. Columbia builds its success on licking problems like this, and dependable equipment plays a vital role. To Columbia that means LeBlond Lathes—for the smooth power, rigidity and versatility they need.

For example, take the job shown on the left. A jet engine rotor compressor disc is being machined from a titanium forging. This contour job is faced on a LeBlond 16″/38″ Sliding Bed Gap Lathe equipped with LeBlond Hydra-Trace*. Operating specifications must remain Columbia's trade secret. We can say, however, that they must hold tolerances as close as .0005″ and finish to 32 microinches.

Columbia explains, "Since these titanium forgings are extremely costly, yet have no chip or scrap value, we must have dependable accuracy and finish without spoilage. Speed is important, too, because of the substantial amount of material that must be removed. LeBlond Lathes have what it takes to do jobs like this successfully, at competitive prices. One word sums up our feelings about LeBlonds—Excellent!"

Whether you're turning tough titanium or more conventional materials, one of LeBlond's 76 lathe models will fill the bill—exactly! LeBlond offers a complete line of lathes from the 13″ Regal to the 50″ Heavy Duty. Also available are Sliding and Plain Bed Gap lathes; Hollow Spindle lathes; Dual Drive lathes; Tool Room and Rapid Production lathes. For the *right* lathe for your job, call your nearby LeBlond Distributor, or write us.

Ask for Catalog 54-A for a description of LeBlond's complete line.

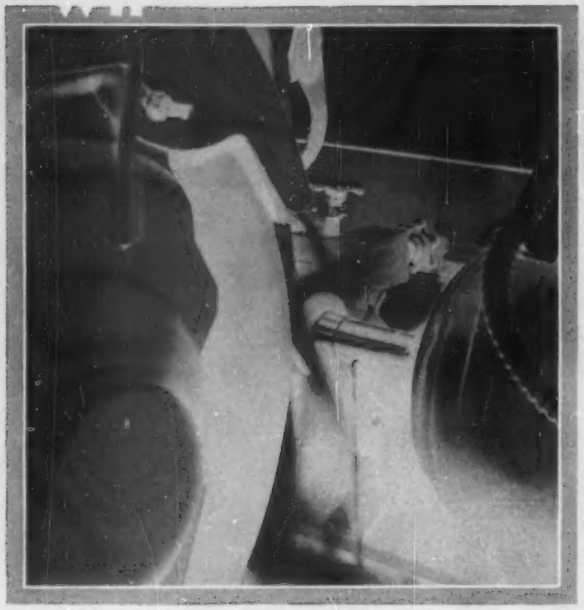
*Hydra-Trace (Trade Mark, Registered U. S. Pat. Office) is LeBlond's heavy-duty hydraulic tracing attachment. Can be mounted in place of the compound rest on practically all LeBlond Lathes.

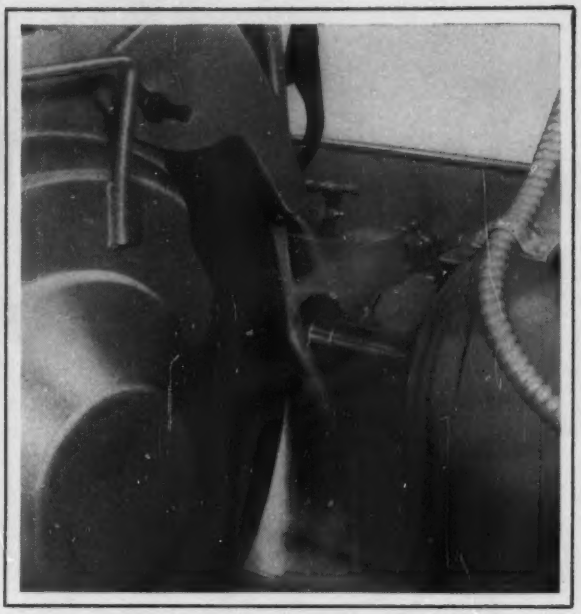
turned faster by

LeBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 66 YEARS.*





A remarkable achievement in precision manufacturing and quality control . . . .

NOW!

Cincinnati Grinding Wheels offer

Positive Duplication

PD

THE DEVELOPMENT of the new CINCINNATI (PD) Manufacturing Process is one of the most important improvements in grinding wheels in years—a development that will save you money and increase your production.

It means a brighter working picture for you because now, through the CINCINNATI (PD) Manufacturing Process you can be *positive* that *every* CINCINNATI (PD) WHEEL you order for a job will be produced exactly to the CINCINNATI grading specified.

Just as a negative guarantees exact duplication of a photograph, the CINCINNATI (PD) *Manufacturing Process assures a Positive Duplication of the original wheel every time you reorder.*

The problem of duplication has been a major concern of Cincinnati Milling throughout its 30 years of practical experience in using grinding wheels, and in supplying industry with precision grinding machines equipped with grinding wheels and ready for production operation. Cincinnati Milling found that once the right grinding wheel had been specified for a particular job, sometimes it was difficult to secure additional wheels of identical grading that would duplicate the performance of the original wheel.

The need for Positive Duplication in the manufacture of grinding wheels is of utmost importance not only to Cincinnati Milling, but to every user of grinding wheels.

Positive Duplication (PD) is the result of extensive manufacturing research which revealed that *several steps* in the production of grinding wheels generally considered as unimportant, were quite to the contrary, *extremely important*. As one step toward (PD) WHEELS, Cincinnati Milling constructed the world's most modern grinding wheel plant. Some of the equipment installed has never before been used by the industry in the manufacture of grinding wheels.

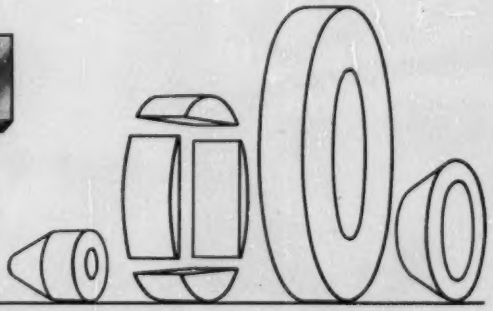
Then, to make (PD) WHEELS an actuality, Cincinnati Milling developed new standards of manufacture with 36 quality control steps. From the weighing of the grain and bonding material, through molding, drying, firing, finishing, to final inspection, every operation is carried out with the same exactness as in building a precision machine tool.

You're assured a Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike. For you, this means *no more production interruptions* which cut output and increase your costs.

Let us prove to you how CINCINNATI (PD) WHEELS will make money for you. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or 'phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI (PD) PRECISION AND SNAGGING WHEELS are available in vitrified and resinoid bonds in a complete variety of popular sizes and shapes.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio

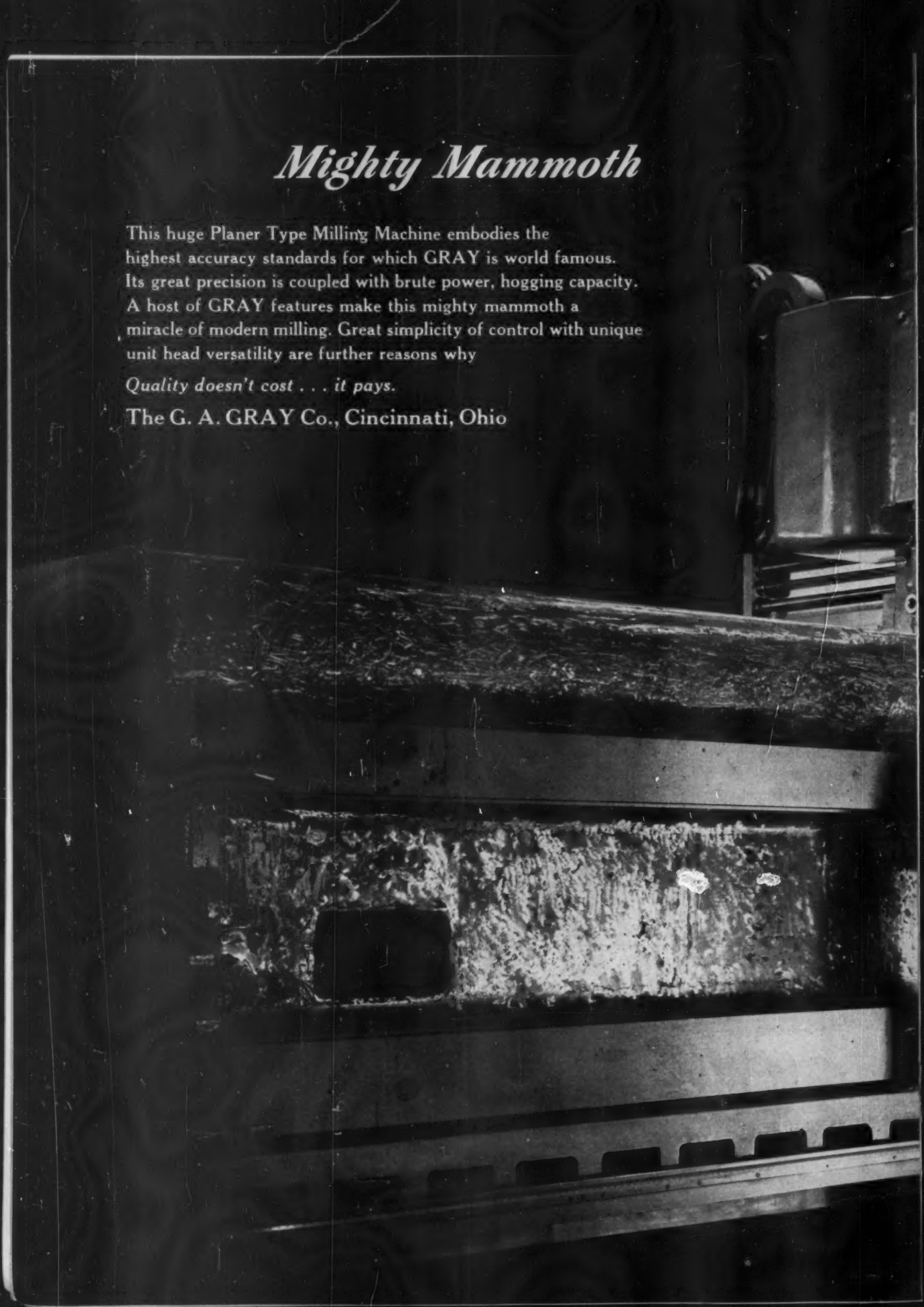


Mighty Mammoth

This huge Planer Type Milling Machine embodies the highest accuracy standards for which GRAY is world famous. Its great precision is coupled with brute power, hogging capacity. A host of GRAY features make this mighty mammoth a miracle of modern milling. Great simplicity of control with unique unit head versatility are further reasons why

Quality doesn't cost . . . it pays.

The G. A. GRAY Co., Cincinnati, Ohio



GRAY

On any carbide grinding job...

Nothing

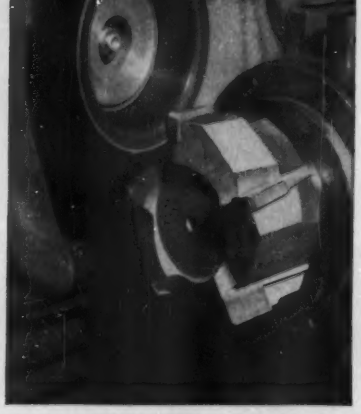
Norton Vitrified Bonded Diamond Wheels

outperform all others of this type. They combine the fast cutting action of resinoid bonded wheels with resistance to grooving approaching that of metal bonded wheels. Great durability is another advantage, since the vitrified bond adheres to the diamond particles and holds each one tightly for maximum useful life.

Production Grinding of Single Point Carbide Tools is most economical and efficient with Norton vitrified bonded diamond wheels. Grinding chip breakers, as illustrated, is another important job for which they are ideal. One outstanding advantage is that they hold their corners exceptionally well.

Norton Resinoid Bonded Diamond Wheels

provide the fast cutting and long, money-saving wheel life that make them favorites for precision sharpening jobs. Made in two bond types — regular, for wet grinding and B6, for dry grinding. It is always more economical to use each bond type on the applications for which it is best suited, rather than to try to make one type serve for both wet and dry grinding.



On Your Multi-Tooth Grinding Jobs, Norton resinoid bonded wheels hold size so that each tooth gets the uniform grinding vital to good cutter performance. And in the straight, thin shapes permitted by the resinoid bond they make excellent cut-off wheels for salvaging damaged carbide tools.

Norton wheel cuts like a diamond

Diamond wheels in carbide grinding more than pay for themselves. "It's just like finding money."

You can cut grinding time — and grinding costs — to the lowest possible by standardizing on Norton diamond wheels.

As a result of Norton Company's long pioneering† in diamond wheel development, Norton diamond wheels bring you a combination of long service life and efficient cutting action that means maximum economy — across the entire range of carbide grinding applications.

Besides the vitrified and resinoid bonded types shown here, Norton diamond wheels are also available in a metal bond — where durability and resistance to grooving, rather than a fast rate of cut, are primary considerations. For every application the proper size and type of Norton diamond wheels are available in a wide variety of grit sizes. (*For small-volume requirements, Norton K Bond* CRYSTOLON* *wheels are often the best investment. See illustrations.*)

See Your Norton Distributor

for aid in selecting the right Norton wheels for every grinding job. And ask him for the 142-page, illustrated booklet: "Grinding Carbide Tools." Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. Listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products . . . to make other products better

Norton K Bond CRYSTOLON* Wheels

feature fast, cool cutting and exceptionally uniform performance. The vitrified K Bond permits half-grade increments of hardness, enabling you to "pin-point" your specifications. Use these wheels for roughing and backing off. Usually preferred in green CRYSTOLON, but also available in gray.

For Small-Volume Carbide Grinding, especially in single-point applications, the K Bond wheels offer outstanding economy. Their high stock removal rate and uniform performance assure quality grinding at lowest cost.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries
†First with resinoid bonded, first with metal bonded, first with vitrified bonded diamond wheels.

W-1579

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

Veeder-Root Hand Tally counts anything you see. Press thumb lever once for each count. Reset to zero with one turn of knob. $8.30 ea. (Write for quantity prices.) Immediate delivery.

If this Clicks often enough... then the show clicks, too!

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

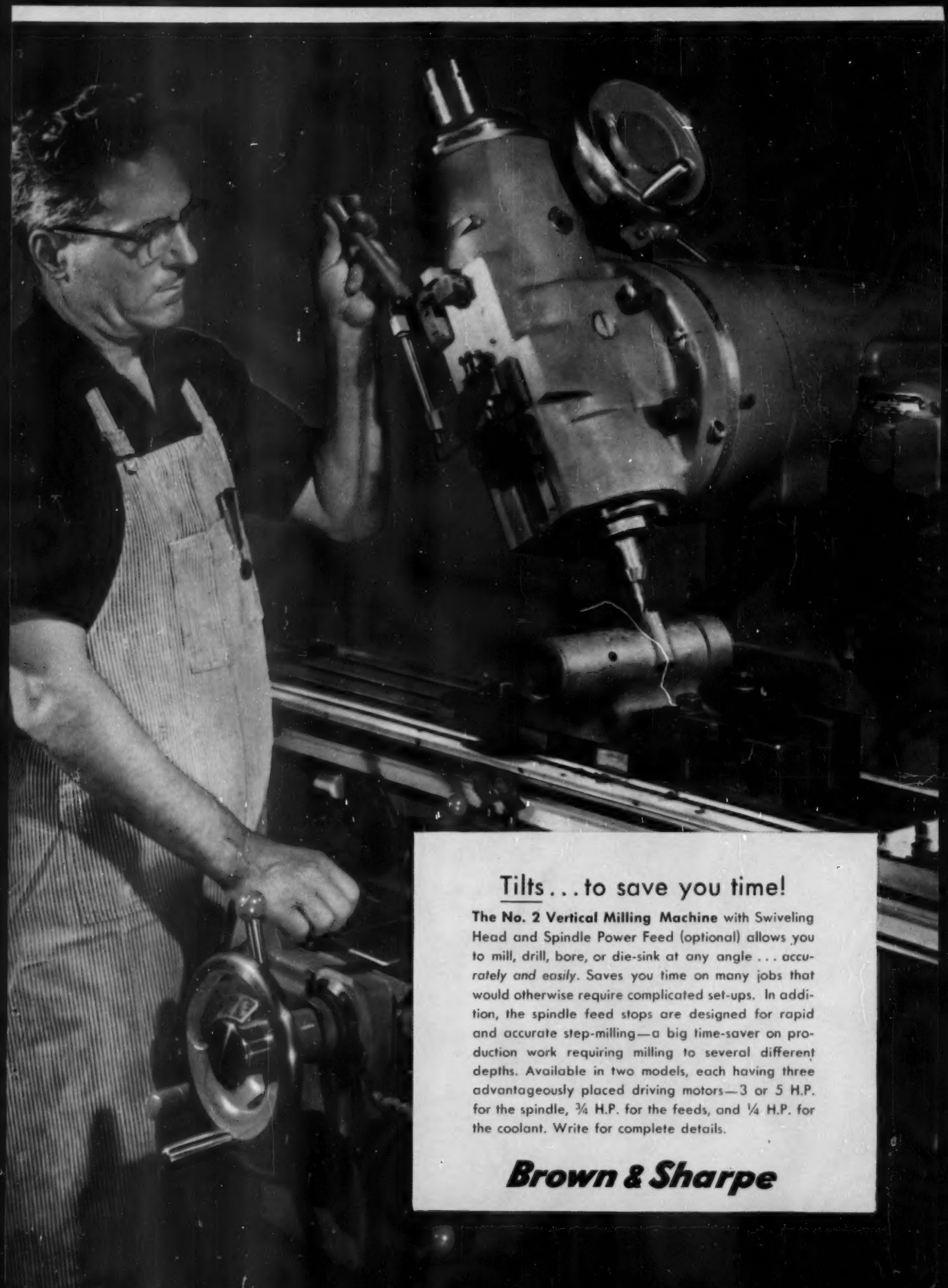
275 laughs in 113 minutes . . . this was the certified count taken at a recent performance of a Broadway show by two executives of Fact Finders Associates, Inc. . . . both using Veeder-Root Hand Tallies.

This is another one of the hundreds of uses for each of the hundreds of Veeder-Root Counters which are made for manual, mechanical and electrical operation. Chances are that *you*, too, can count on Veeder-Root . . . with counters built into your products as standard parts, or attached to your production equipment. We'll help you to figure out how. Write:

VEEDER-ROOT INCORPORATED
HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

"The Name That Counts"



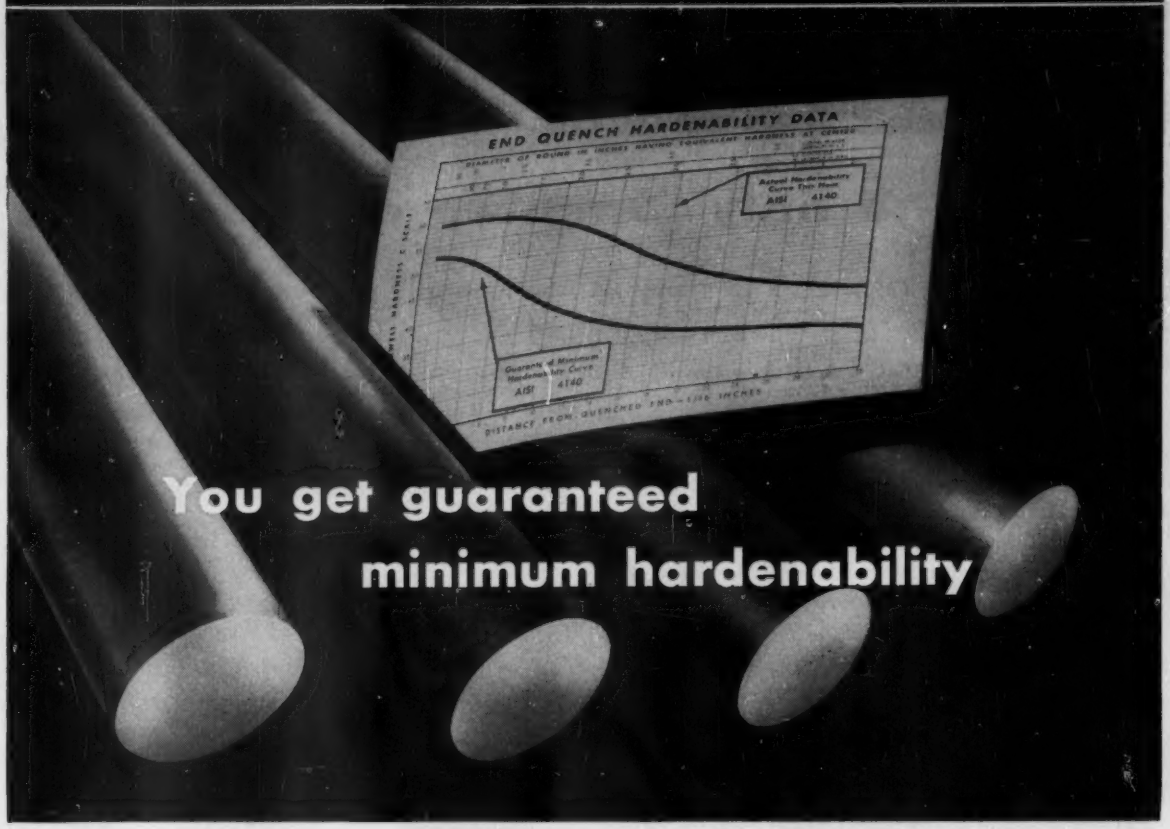
Tilts . . . to save you time!

The No. 2 Vertical Milling Machine with Swiveling Head and Spindle Power Feed (optional) allows you to mill, drill, bore, or die-sink at any angle . . . *accurately and easily*. Saves you time on many jobs that would otherwise require complicated set-ups. In addition, the spindle feed stops are designed for rapid and accurate step-milling—a big time-saver on production work requiring milling to several different depths. Available in two models, each having three advantageously placed driving motors—3 or 5 H.P. for the spindle, ¾ H.P. for the feeds, and ¼ H.P. for the coolant. Write for complete details.

Brown & Sharpe

More For Your Money...
. . . Brown & Sharpe End Mills. You get more clean cuts per dollar invested with these quality end mills. Made to be the best you can buy, they give you real economy through highest quality. Therefore, when you order end mills, why not get the most for your money . . . choose from the complete line by Brown & Sharpe. Write for Catalog 35C.
BUY THROUGH YOUR LOCAL DISTRIBUTOR
B·S
Brown & Sharpe
BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.
Milling Machines • Grinding Machines • Screw Machines
Cutters • Machine Tool Accessories • Machinists' Tools
Electronic Measuring Equipment • Johansson Gage Blocks
Permanent Magnet Chucks • Pumps
Printed in U.S.A.

WHY IT PAYS TO BUY ALLOY STEELS FROM US



• You *know* what you're getting when you buy alloy steels from U. S. Steel Supply. For with each lot you purchase, we furnish a personalized data card. This card charts the guaranteed minimum hardenability and gives analysis information and recommended tempering and working temperatures. You are thus assured of getting in full measure the tensile strength, fatigue resistance, ductility and toughness that your design requires. We can assure maximum machinability too, for we adhere to unusually strict metallurgical standards in the purchase of all our alloys.

Have you ever seriously considered how alloy steels might contribute to your production of a better product at a cost that might be even lower than at present? If not, it will pay you to call U. S. Steel Supply. One of our salesmen will gladly study your specific problems and, if alloy steel will do a better job for you, he will recommend the best alloy and see that you get it promptly.

Call us for: USS Carilloy alloy steels—hot rolled rounds, cold finished rounds, squares, hexagons, "FC" (Free-Cutting) rounds; USS Carilloy Aircraft Quality hot rolled rounds and flats and cold finished rounds, squares, hexagons, flats.

TRIPLE SECURITY

What you want
When you want it
At the right price

U. S. STEEL SUPPLY
DIVISION

General Offices
208 So. La Salle St., Chicago 4, Ill.

USS

Warehouses and Sales Offices
Coast to Coast

USS STEEL
UNITED STATES STEEL

UNITED STATES STEEL

Announcing the Moore-Fosdick

The only machine of its kind in

• Greater range—22″ x 42″ x 27″ height • Automatically positions work to ±.0001″

• Grinds jigs, dies, punches, templates and machine parts • Infinite Grinding Speeds—12,000 to 60,000 rpm • Contour and Chop Grinding • Slot Grinding Attachment • Spindle-Housing Heat Control

This new machine combines the unique Moore Jig Grinding Head with the exclusive Fosdick Automatic Positioning Table. It gives you greater capacity for precision grinding with the speed and convenience of a table that automatically positions work to ± .0001″. *There is no other machine in the world that even approaches the Moore-Fosdick in jig-grinding capacity, versatility, convenience and precision!*

Grinds Cylindrical and Tapered Holes. The Moore-Fosdick allows you to grind cylindrical as well as conical holes, with taper in either direction. An angular and indexing device built into the main spindle, and the newly developed slot grinding attachment, permit the quick, accurate grinding of any contour—*regular* or *irregular*.

Large Work Capacity—Infinite Number of Speeds. The Moore-Fosdick A. P. Jig Grinder has an infinite range of grinding speeds – from 12,000 to 60,000 rpm . . . allowing extreme versatility and accurate control of grinding and stock removal. Larger table size and greater work height, coupled with greater power, *extend* the overall range of precision grinding operations.

SPECIFICATIONS

Capacity:	**No. 30-G**	**No. 42-G & No. 42-PG***
Table size	36″x18″	44″x22″
Table travel, Longitudinal	30″	42″
Table travel, Crosswise	17½″	22″
Table top to wheel collet	2″ to 27″	2″ to 27″
Spindle to column ways	18½″	18½″
Spindle to column below ways	20″	25¼″

Four spindle speeds: 90, 120, 180, 240

Spindle feeds by air-powered hydraulic control—infinite speed control

Grinding speeds: 12,000 to 60,000 rpm; 3 heads

Grinding Capacity:
With grinding wheels, 3/16″ to 5″ (8″ with adapter)
With diamond mandrels 1/64″ to 3/16″

Travel main spindle slide... 3⅛″

Angular adjustment of spindle up to 1½° either way or 3° included angle.

Radial offset of grinding spindle–from center to 1⅛″ off center by rough adjustment–while running 0.0001″ adjustment for distance of 0.075″ anywhere in the 1⅛″ range.

Weights and Floor Space:	**No. 30-G**	**No. 42-G & No. 42-PG**
Machine with regular equipment, including motor	6000 lbs.	11,000 lbs.
Shipping weight	6750 lbs.	12,000 lbs.
Floor space	77″x82″	102″x128″

Standard Equipment:
Four-speed constant torque ¼ hp motor, 220-440 volts, 50-60 cycles, 2-3 phase, wheel dresser—micrometer stop-wrenches. Two built-in locating devices: two 1″ .0001 inside micrometers; two 1″, 2″, 3″, 4″, 5″, 10″ and one 15″ end measurers in box.

Compressed Air Requirements:
90 to 100 lbs. @ 15 cfm, furnished by customer. We recommend a heavy-duty 7.5 hp air compressor with a water aftercooler, provided it is capable of this output.

*42-PG Moore-Fosdick Jig Grinder with Automatic Positioning.

Write today
for price and delivery information.

Jig Grinder

the world!

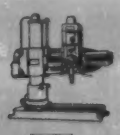
Cross Power Traverse Safety Switch and Positioning Control

Grinding Wheel Outfeed, Reads .0001", Adjustable while running
Vertical Slide Taper Setting
Positive Adjustable Depth Stop, Micro Setting
Depth Measuring Dial Reads to .001"
Heating Elements for Continuous Temperature Control of Spindle Housing
Grinding Wheel Outfeed Slide, Course Adjustment
Longitudinal Power Traverse Safety Switch and Positioning Control
Measuring Rods or Duplicating Bars
Push Buttons to Control Table and Slide Rapid Traverse and Positioning of Table and Slide
MOORE-FOSDICK

Positions Work Automatically to ± .0001". With the Automatic Positioning Table, you can get fast and accurate positioning of parts to be ground. Two simple duplicating bars may be prepared to position work automatically to ± .0001" — at the touch of a pushbutton. This means that complex grinding jobs with hundreds of holes require only one set-up. On "one-time" jobs, measuring rods can be used in place of bars. For precision production jobs, the easily-made, easily-stored duplicating bars give you a permanent record of positions. Once a job is run, you store the bars and use them every time you rerun that same job — weeks, months or years later.

Grinder Head Dimensional Stability. Latest design of the grinding head incorporates new features to improve further its stability. These include: (1) Electric heating elements in the main spindle housing to maintain uniform temperature whether machine is running or not; (2) An observation thermometer so located as to indicate any temperature change within the housing; (3) The housing itself is cast from 36% nickel iron to reduce the effect of any possible temperature variation to an irreducible minimum.

Need Drilling Equipment? Get a Proposal from Fosdick!


Radial Drills

Jig Borers

Sensitive and Upright Drills

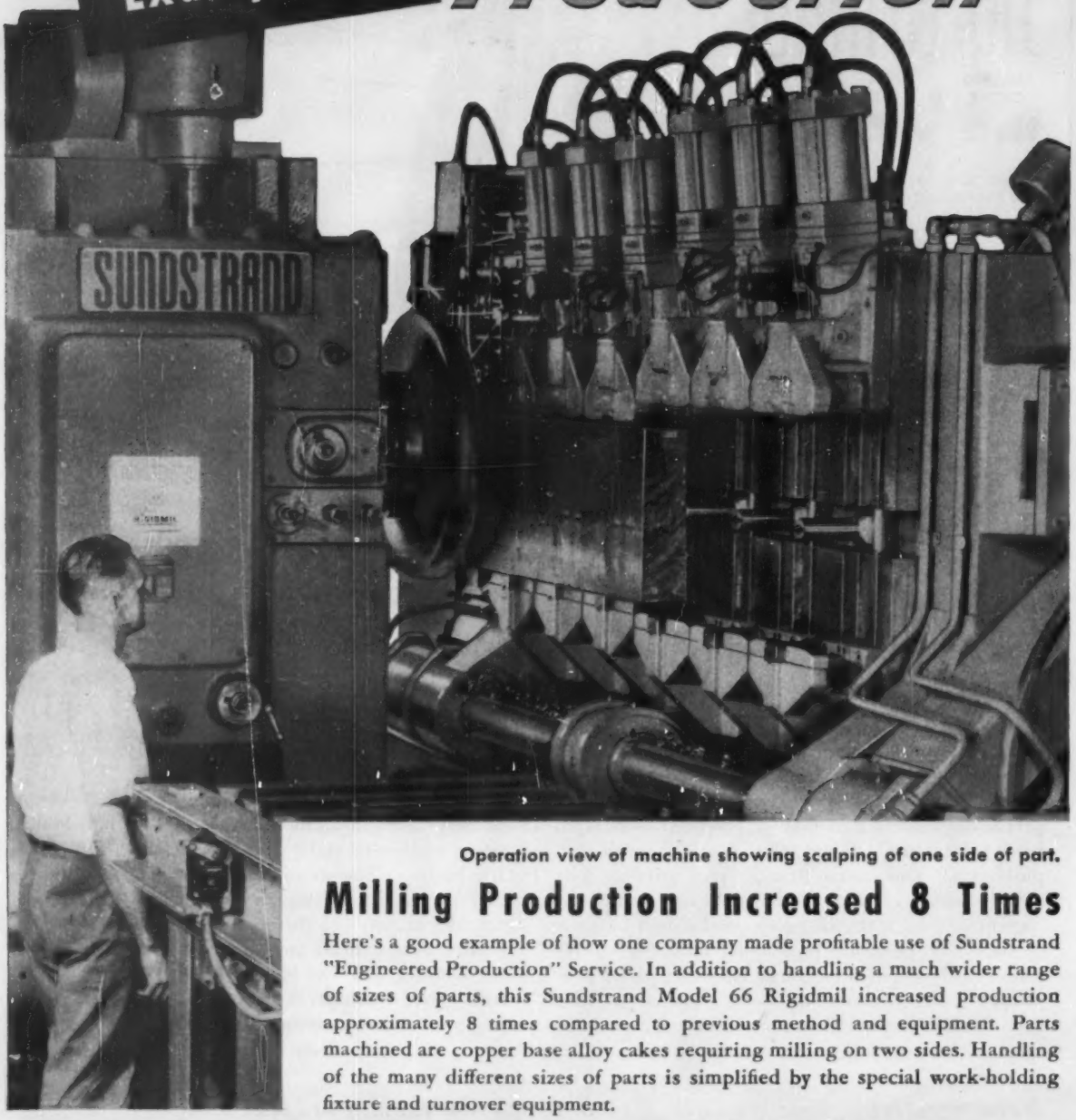
Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

Another Example of SUNDSTRAND "Engineered Production"



Operation view of machine showing scalping of one side of part.

Milling Production Increased 8 Times

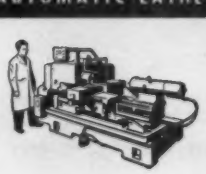
Here's a good example of how one company made profitable use of Sundstrand "Engineered Production" Service. In addition to handling a much wider range of sizes of parts, this Sundstrand Model 66 Rigidmil increased production approximately 8 times compared to previous method and equipment. Parts machined are copper base alloy cakes requiring milling on two sides. Handling of the many different sizes of parts is simplified by the special work-holding fixture and turnover equipment.

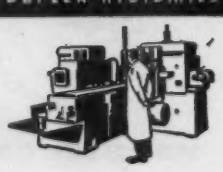
SUNDSTRAND

"Engineered Production" Service*

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





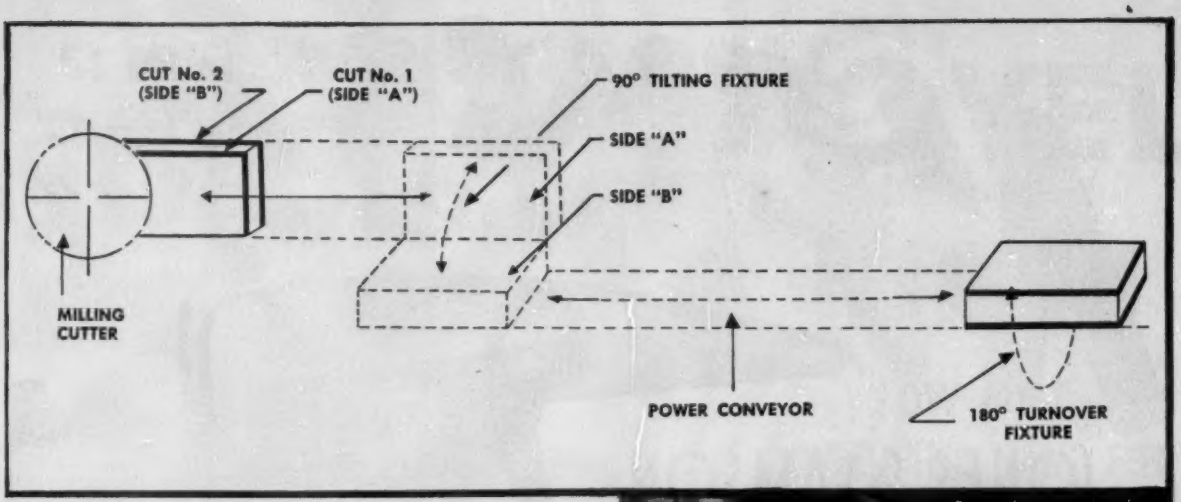
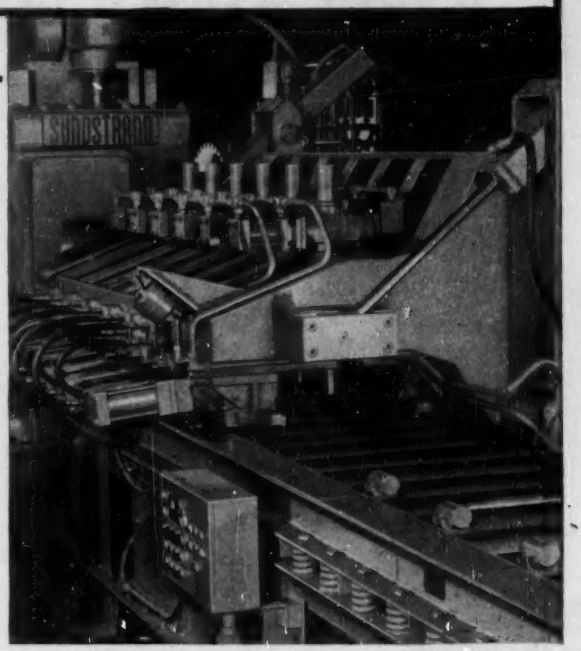


Diagram illustrating sequence of operations.

Close up of work-holding fixture in pick-up position. →



The complete cycle is controlled by the operator from a push button station. First the cakes are loaded onto the conveyor by crane. Then the hydraulically operated fixture is lowered and cake guided into clamping position on power-driven rollers. With the part clamped, the fixture is raised and fed past a 30″ diameter cutter for face milling one side. The fixture then rapid returns to its starting position and pivots down to the conveyor rollers. The clamps release the work onto the conveyor, and the rollers, now in reverse, carry the cake back into turnover fixture. The turnover fixture rotates 180° and places cake back on the rollers and the cycle is repeated for milling opposite side.

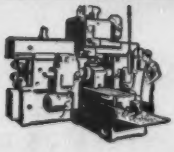
Use Sundstrand "Engineered Production" Service

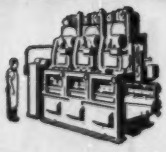
This is but one of many examples of the practical application of Sundstrand "Engineered Production" Service. This same service is available to you without obligation.

Free Data

Additional information on Sundstrand "Engineered Production" Service as applied to milling problems is included in this booklet. Write for your copy today. Ask for bulletin 147.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





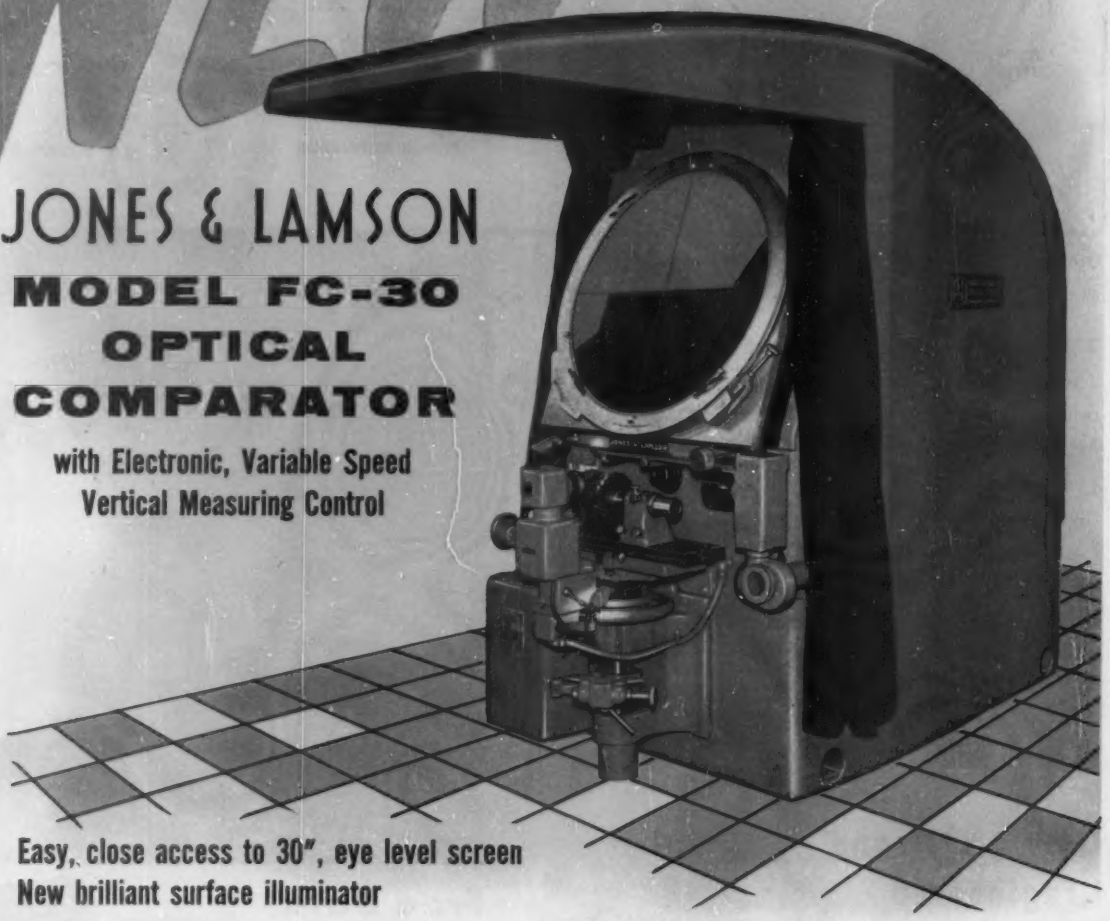
SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

NEW

JONES & LAMSON

MODEL FC-30 OPTICAL COMPARATOR

with Electronic, Variable Speed Vertical Measuring Control



Easy, close access to 30″, eye level screen
New brilliant surface illuminator

Thirty-five years' experience in developing optical comparators—16 years' experience with 30″ viewing screens—has gone into making this ultra-modern precision inspection machine.

Built to highest machine tool standards, its wholly integrated design allows the operator to view the entire screen at close range while making quick, accurate measurements.

Electronic, variable speed vertical measuring control allows the work piece to be raised or lowered, slowly or rapidly to the exact measuring point desired. Imagine — quick, precise measurements to .0001″, in one motion, with fingertip pressure.

The FC-30 also has these additional *exclusive features*: 5″ and 8″ diameter capacity with easy change-over; 6″ projection lens optional; carbide tipped micrometers graduated for direct reading in either direction, combined with micrometer zeroing anvil; measuring dial illuminators.

Available for immediate delivery.

P.S. *Write today for folder containing complete information.*

JONES & LAMSON

World's largest manufacturer of Optical Comparators since 1919

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A. **OPTICAL COMPARATOR DIV.**

Another
COVEL
80th
Anniversary
Presentation

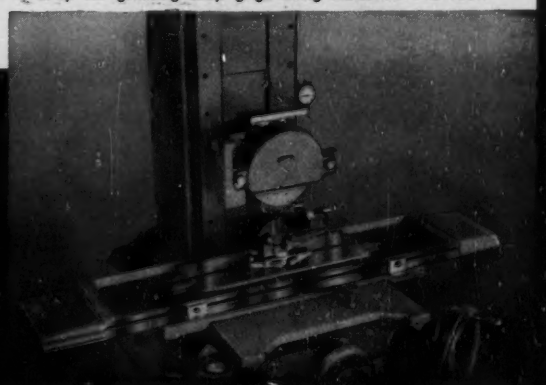
The New COVEL NO. 10

LOW COST POWER AND HAND FEED SURFACE GRINDER

This all-new 6" x 18" Surface Grinder is designed to provide low cost precision gage and form tool work, as well as surface grinding. It will grind work 6" x 18" x 15" under a 7" diameter wheel, has table speed of 10 to 50 feet per minute and longitudinal table travel of 20". Table is driven by special timing belt eliminating rack and gear. Its automatic cross feed is adjustable from .002 to .050 at *the end* of each table stroke. The grinding wheel head uses any popular make 1 H.P., 3600 RPM direct motor driven spindle. Hand scraped ways, dust proof motor control enclosure, one shot lubrication system, rugged construction with heavily-ribbed semi-steel cast base all go to make the *Covel No. 10* outstanding as a tool room surface grinder.

Send for Bulletin AM-194

Set-up for grinding snap gage using indicators and rods.



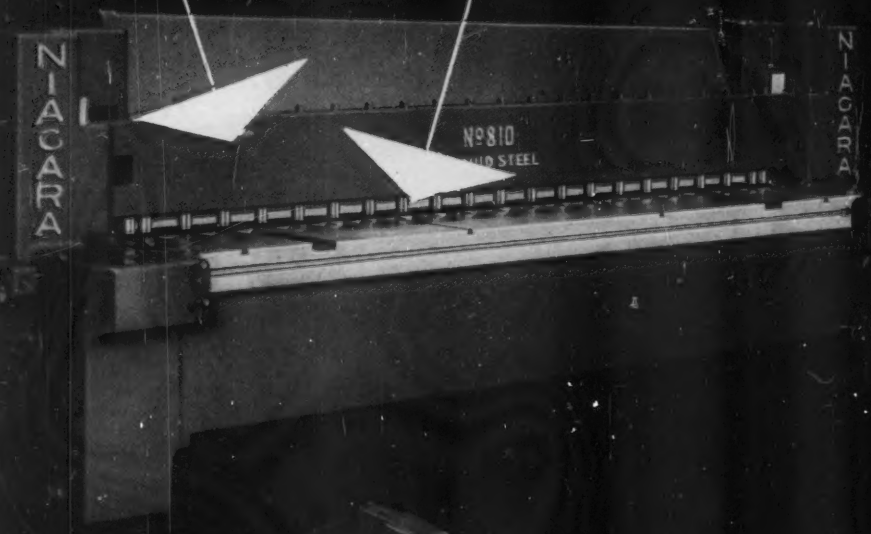
80 YEARS of continuous manufacturing experience makes your COVEL choice a sound one.

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

DRILL GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS

SELF-COMPENSATING HOLDDOWN



NIAGARA
MACHINE & TOOL WORKS
1979 75 1954

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

a BIG FACTOR in the superiority of Niagara Shears

"STRAIGHT-EDGE" CUTTING ACCURACY
Positive, power actuation grips work securely for maximum cutting accuracy.

LOW IMPACT AVERTS DAMAGE AND INACCURACY
Individual pressure feet contact work with low impact, thus safeguarding both the material and bed against damage, as well as reducing noise level. No hammer-blows to mar work. No peening of bed with resulting distortion of knife seat.

SIMPLIFIED, LOW UPKEEP DESIGN
Simplicity of design and construction, involving a minimum number of parts, assures negligible servicing. With *less* to go wrong, there is *less* to repair and replace.

HOLDS WORK FLAT AND STATIONARY
Multiple pressure feet on 6" centers, applying uniform pressure, hold work flat and tight against bed to assure utmost shearing accuracy. No rippling of sheet between feet as cut progresses. Firm grip on short pieces.

HANDLES STOCK OF VARYING THICKNESS
Individual feet are self-compensating, requiring no adjustment for cutting stock of different thicknesses . . . *even at the same time.*

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES: Detroit • Cleveland • New York • Philadelphia

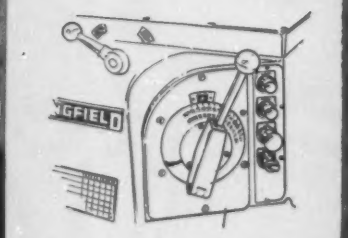
Dealers in principal U. S. cities and major foreign countries

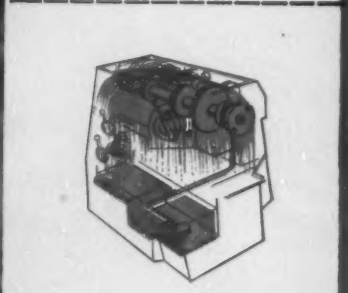
In a power squaring shear, no *single* feature nor component can be fully responsible for accuracy, speed and economy. *They* result from a *combination* of features such as the self-compensating holddown; rigid, fully closed box section construction of bed and crosshead; low slope of upper knife; ample and accurately held crosshead guides; multiple point sleeve clutch — the very features that have established the marked superiority of Niagara's Underdrive Series.

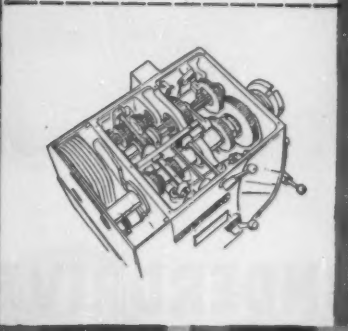
For the whole story, straightforwardly presented, on America's most complete line of underdrive power squaring shears, with capacities from shim stock to 1 in. thick mild steel (lengths 3 to 20 ft.), request *Niagara Bulletin 69*. Write today.

NIAGARA

UNDERDRIVE SQUARING SHEARS







it does more work (and the operator does less)

Simple, least-effort controls: color-coded dial selection of 24 spindle speeds; four levers for totally enclosed gear box; tailstock wheel set at angle for easiest operation; wheel has two speeds, one for normal operation, one for drilling; chip pan on casters for quick movement to insure cleaner, safer floors.

it runs cooler

Continuous oil-mist lubrication of all headstock gears does more than lubricate; it carries heat away into large sump in headstock leg. Cooler head minimizes distortion during warmup; markedly improves accuracy and stability of work alignment.

it saves power, cuts wear

The headstock has only four gears in mesh at once for any speed. Other gears run free; flywheel action adds to stability. No "pass-through" gears in shifting.

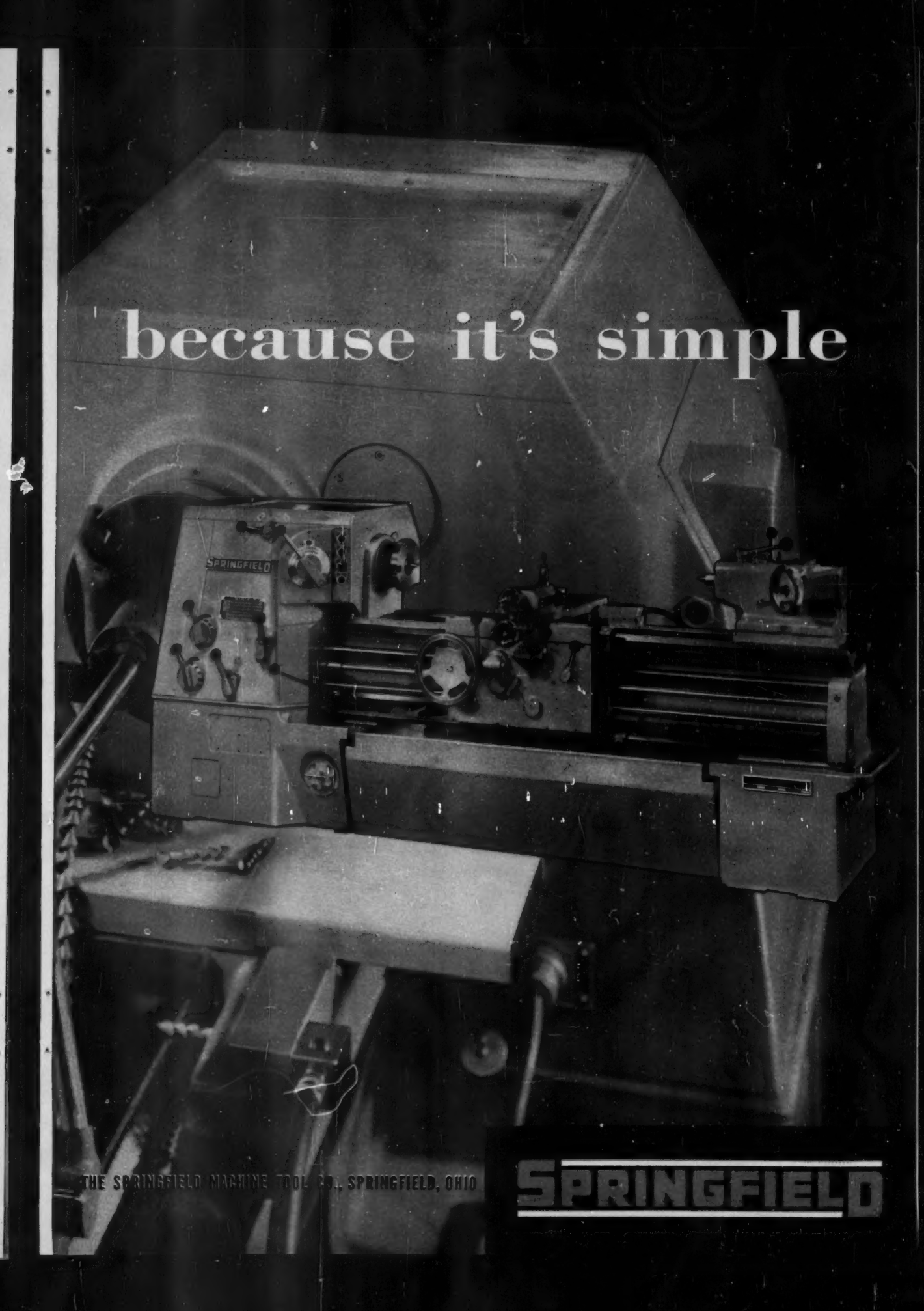
it promotes cleanliness—and safety

Clean modern design encourages good shop practices, better maintenance; builds pride in workmanship and better quality in work produced.

Engine and toolroom lathes: swings 14″ to 32″
Contouring and reproducing lathes: swings 14″ to 32″
Universal vertical grinders: swings 21″ to 52″

write for name of your nearest dealer

67TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS


because it's simple
SPRINGFIELD
THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO
SPRINGFIELD

DANLY

Blanking

COSTS LESS ON A DANLY PRESS

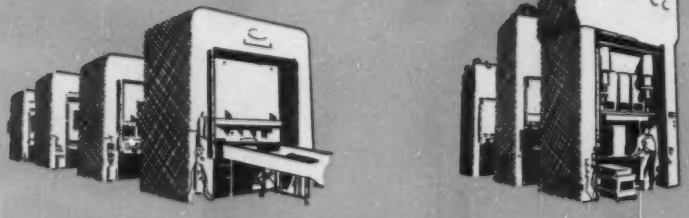
Unique new features, engineered for dependability, increase production

Now, blanking costs can be lower than ever before whether your operation calls for high speed lamination stamping at 400 strokes per minute or producing big blanks from coils or sheet.

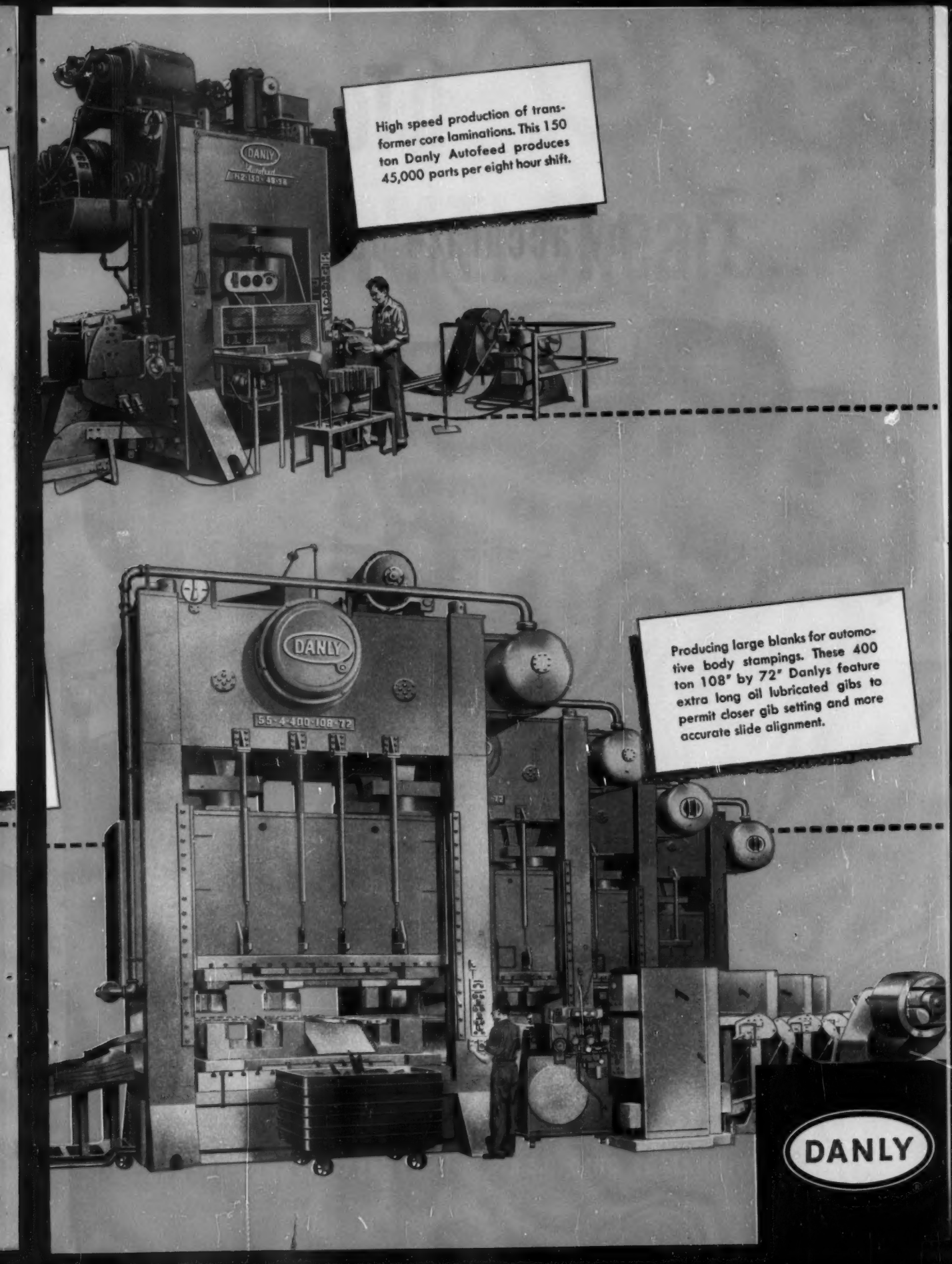
Why? Because Danly's heavier construction gives reserve strength to meet the demands of continuous peak load operation. Exclusive Danly electrical and pneumatic controls make automation of auxiliary equipment easier and faster . . . saving setup and change-over time. Extra rigidity increases die life. Automatic oil lubrication assures dependable performance and low maintenance costs.

Whether you are expanding or replacing facilities, it will be worth your while to talk to a Danly Press engineer.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois



Danly offers any press you need for blanking, drawing or any secondary operation . . . single, double or triple action . . . overdrive or underdrive . . . to suit your plant layout. Make your press line a Danly line and save costs at every stage of your stamping operation.


DANLY
Autofeed
H2-150-48-18
High speed production of transformer core laminations. This 150 ton Danly Autofeed produces 45,000 parts per eight hour shift.
DANLY
55-4-400-108-72
Producing large blanks for automotive body stampings. These 400 ton 108" by 72" Danlys feature extra long oil lubricated gibs to permit closer gib setting and more accurate slide alignment.
DANLY

Test cuts

by accurate performance of

Photos courtesy
Brown-Wales Company,
Cambridge, Mass.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

eliminated CINCINNATI Shears...

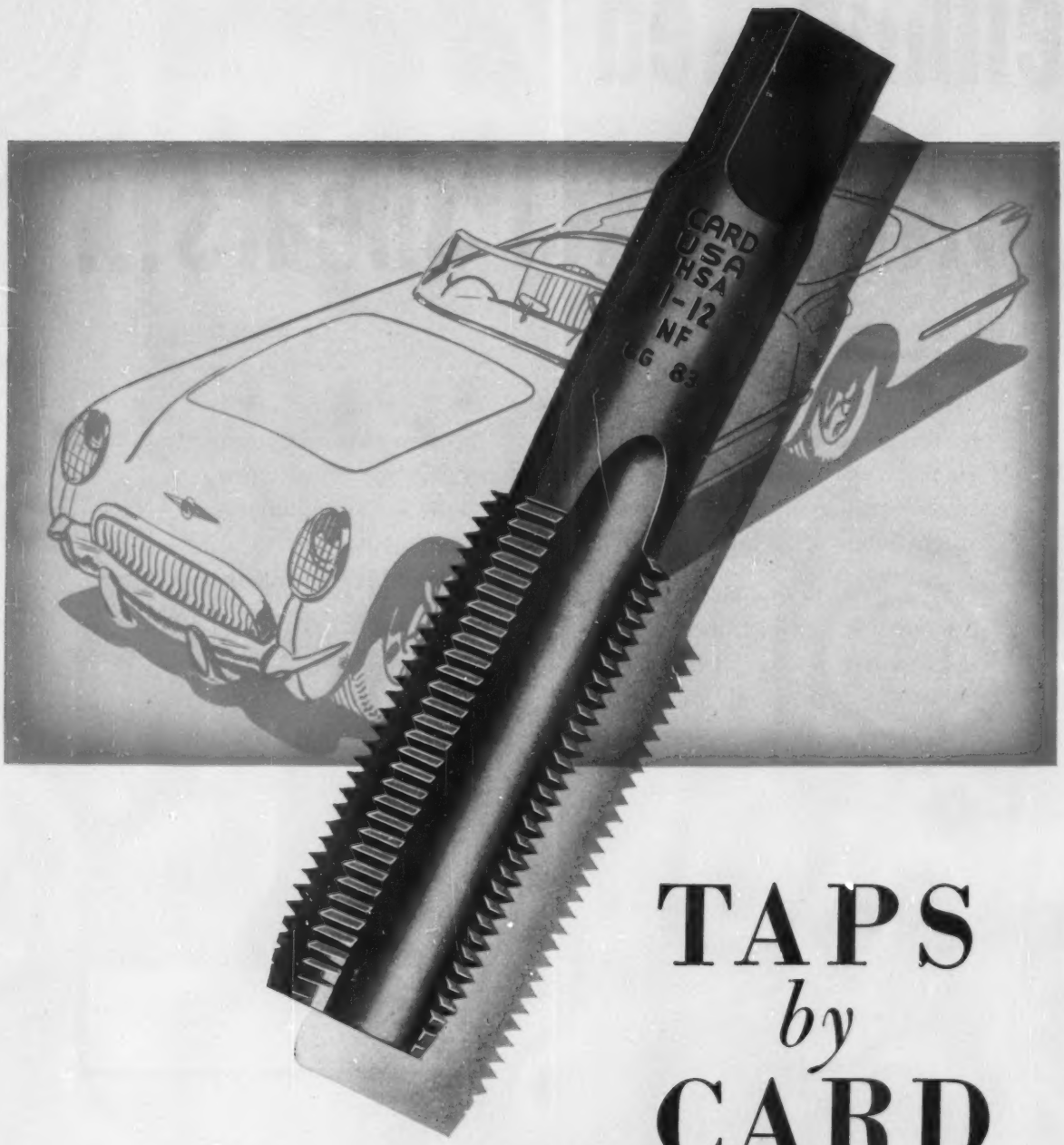
Brown-Wales Company says:

"As a steel warehouse, we have comparatively few production jobs, however, we have found that our men with this new shear can turn out far more work in an hour or a day than they could with the old one. In the first place, the power operated back gauge is a great time-saver when changing, as we frequently do, from one job to another.

"Secondly—the greater accuracy of the shear has made test cuts unnecessary, so that down time between runs is greatly reduced."

Write for Shear Catalog S-6.

The Buttons that save time. The great time-saver—the Cincinnati front controlled Power Back Gauge.



TAPS *by* CARD

Whether its high precision on mass production or on special manufacturing lines, the extra value Card builds into its taps always pays off in performance.

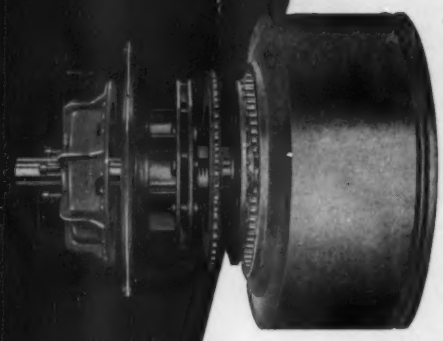
The CARD Quality

Completely stocked offices at Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco and Seattle

See your local Card distributor for prompt deliveries and helpful service

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO. • **TAPS • DIES • SCREW PLATES**

Columbia
STEEL SQUARING SHEARS
up to 75% less gear wear
with the exclusive air clutch!



Exploded View of Air Operated Disc Clutch

. . . another Columbia exclusive. It eliminates unnecessary gear wear

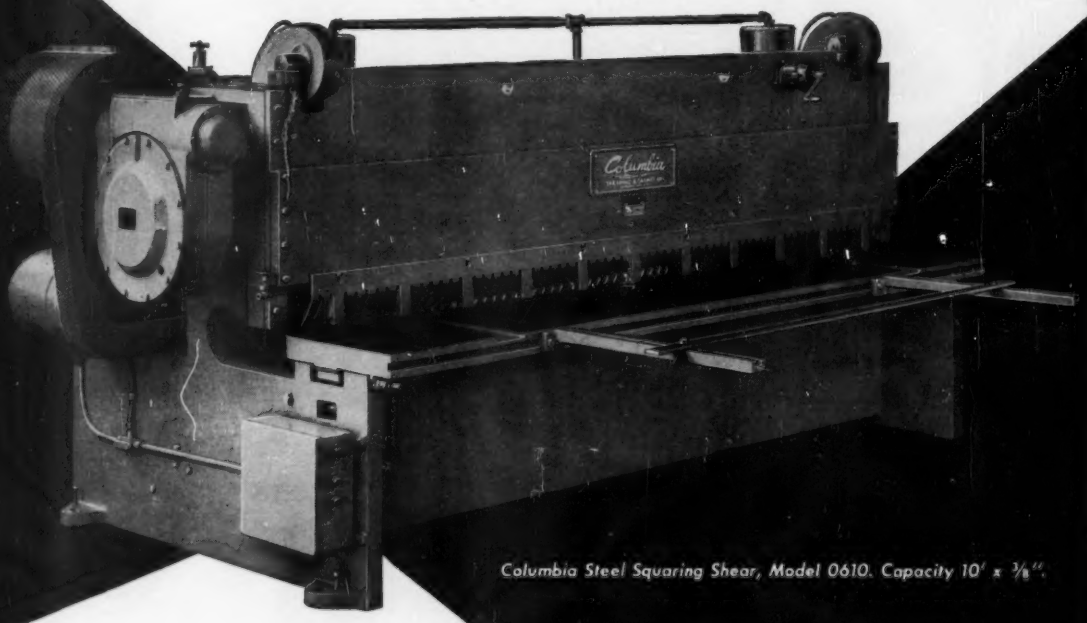
. . . gives never-failing overload protection

. . . cushions shock!

A cost-reducing, safety Air Clutch is one of the many exclusive, built-in Columbia "New Series" Shear features.

This air-operated clutch reduces gear wear as much as 75% since all gear movement is eliminated except in the actual cutting cycle. Inherent clutch slippage at the overload point protects machine and drive. Air-application of power is soft; shocks are not transmitted.

Other Columbia features you should know about include the exclusive Quick-Set Blade Clearance, Hydraulic Hold-downs, Jog Control for Ram Back Brace Adjustment, Air Counterbalances, Remote Foot Switch, and others. Together with basic ruggedness, rigidity and long-lasting accuracy these features mean that Columbia Shears offer more machine for the money!



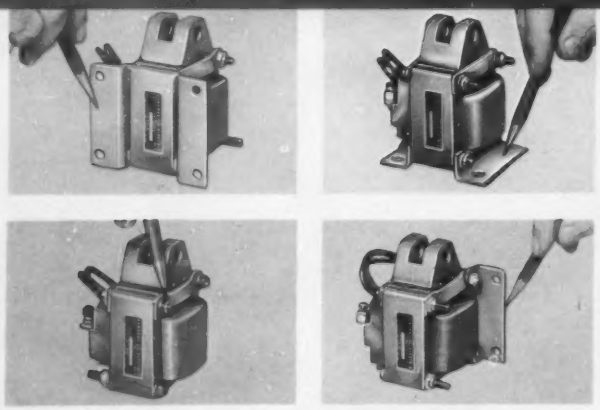
Columbia Steel Squaring Shear, Model 0610. Capacity 10' x 3/8".

Other exclusive Columbia features are explained in detail in FREE Bulletin No. PS-2. Write for it and the name of your Columbia dealer, *today!*

COLUMBIA DIVISION, THE LODGE & SHIPLEY CO.
HAMILTON 2, OHIO

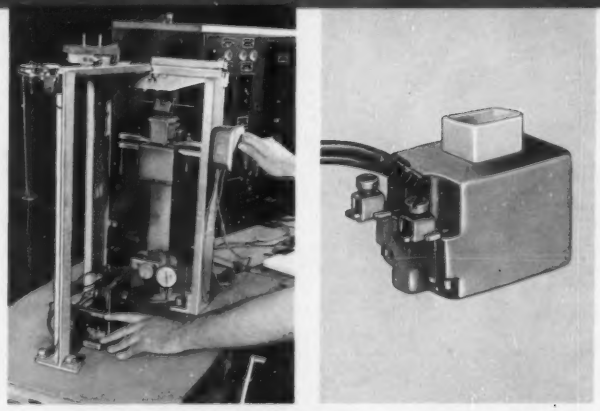
new series **Columbia** STEEL SQUARING SHEARS and POWER PRESS BRAKES

GREATER FLEXIBILITY



New General Electric solenoids mount in five positions — end, right- or left-side, throat, or with thru-bolts. Both leads and built-in terminal board on strongbox coils give added flexibility.

LONGER LIFE



Laboratory tests proved the new strongbox solenoid has much longer life. Long life results from design features such as strongbox coil, and double-strength, spring-steel mounting brackets.

G. E. ANNOUNCES

NEW STRONGBOX SOLENOIDS

The all-new line of General Electric industrial solenoids was designed to include the features you requested. From your requirements, design specifications for the new line were written — and here is the new, more economical solenoid you asked for.

GREATER FLEXIBILITY

New solenoids mount in five positions. Mounting brackets can be moved to any of the four sides, or thru-bolts can be used. Both leads and built-in terminal board on strongbox coils make either type wiring immediately available.

LONGER LIFE

New General Electric solenoids last longer because of new design components. Strongbox coils, enclosed layer wound Formex* windings, give long electrical life. New double-strength, spring-steel mounting brackets contribute to added life. New design also includes glass fabric plunger guide, and larger linkage-pin hole.

COMPLETE RATING COVERAGE

Complete coverage is supplied by nine ratings in each of the following forms (nominal ratings at maximum stroke).

3.0 to 40 lbs in ½ inch pull forms
1.4 to 36 lbs in 1 inch pull forms
2.0 to 33 lbs in ½ inch push forms
4.3 to 28 lbs in 1 inch push forms

Sizes are available in 60, 50 and 25 cycle, and d-c forms. Voltage ratings are from 24 to 600 volts.

SMALLER SIZE

22 percent smaller for the same power ratings, new General Electric solenoids will reduce space problems when mounting solenoids in your equipment. Smaller enclosures and reduced material costs make new solenoids more economical.

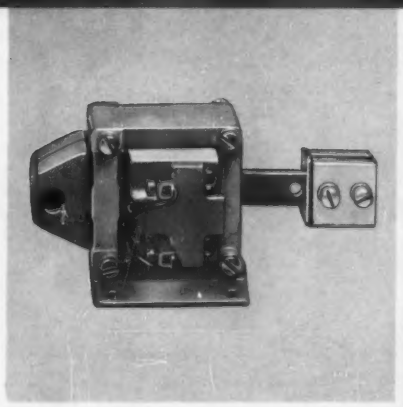
FOR MORE INFORMATION contact your nearest Apparatus Sales Office, or Distributor, or write Section 730-58, General Electric Company, Schenectady 5, N. Y. Ask for Bulletin GEA-6215.

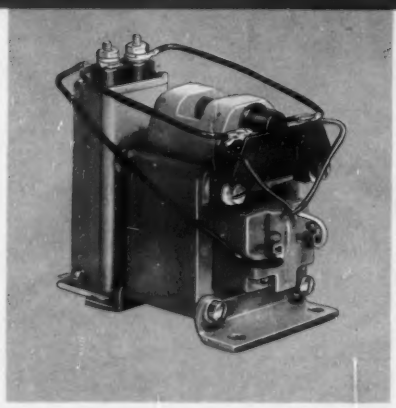
*Reg. Trademark. General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

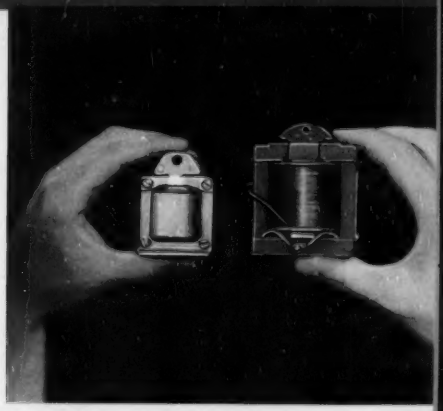
COMPLETE RATING COVERAGE



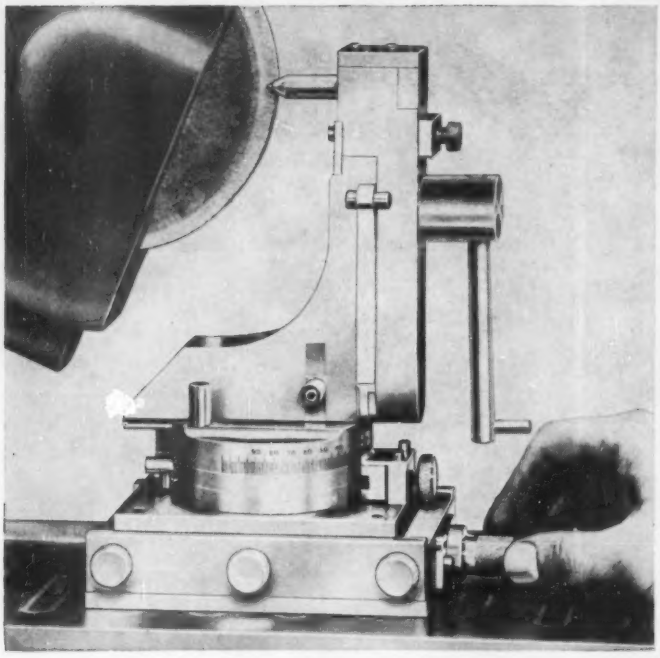


Supplied by nine force ratings in each of the forms, new strongbox solenoids are available in both push and pull forms, at one-half and one inch strokes. All these sizes are available in d-c, 25, 50, and 60 cycle a-c, with voltage ratings from 24 to 600 volts.

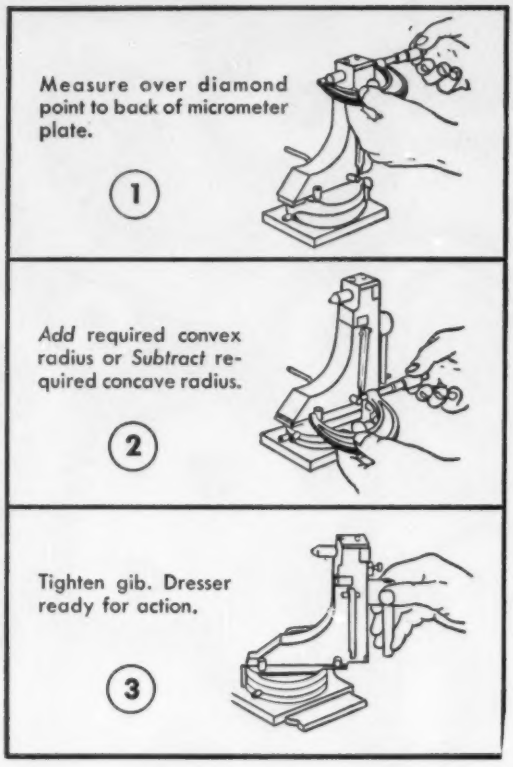
SMALLER SIZE



22% smaller for the same power ratings, new General Electric solenoids will reduce space problems in your equipment.



YOU CAN DRESS WHEELS UP TO 24" IN DIAMETER WITH J & S "FLUIDMOTION" WHEEL DRESSERS. MODEL REC SHOWN HERE.


Measure over diamond point to back of micrometer plate.
1
Add required convex radius or Subtract required concave radius.
2
Tighten gib. Dresser ready for action.
3

How to set angles in seconds, radii in minutes—save hours

These easy instructions show you how you can with a J & S "Fluidmotion" Wheel Dresser

Dressing wheels with a J & S "Fluidmotion" Wheel Dresser is easier than you might think. All you need is a micrometer and simple hex wrench. With a little practice, you can set 2 angles in about 10 seconds, a radius in just 2-3 minutes. Here's how to go about it:

To Obtain One Angle

Adjust center line of grinding wheel to height of diamond. The swivel base of the dresser is graduated at 100° on each side of center. Loosen knurled knob and hold both pins which protrude from bottom rings. Then simply set desired angle, tighten the knurled knob, and you're ready for action.

To Obtain Two Angles

Loosen knurled knob and set the pin on the *bottom ring first* for one angle. Then move pin on the middle ring for the other angle. Tighten the knurled knob—that's all there is to it.

To Obtain a Convex Radius on Grinding Wheel

Measure master reading over diamond point to back of micrometer plate (drawing #1) . . . for example	2.531"
Add required convex radius (drawing #2)	+ .069"
Setting for micrometer pins	2.600"

To Obtain a Concave Radius on Grinding Wheel

Measure over diamond point to back of micrometer plate (drawing #1) . . . for example	2.900"
Subtract required concave radius (drawing #2)	−2.142"
Setting for micrometer pins	.758"

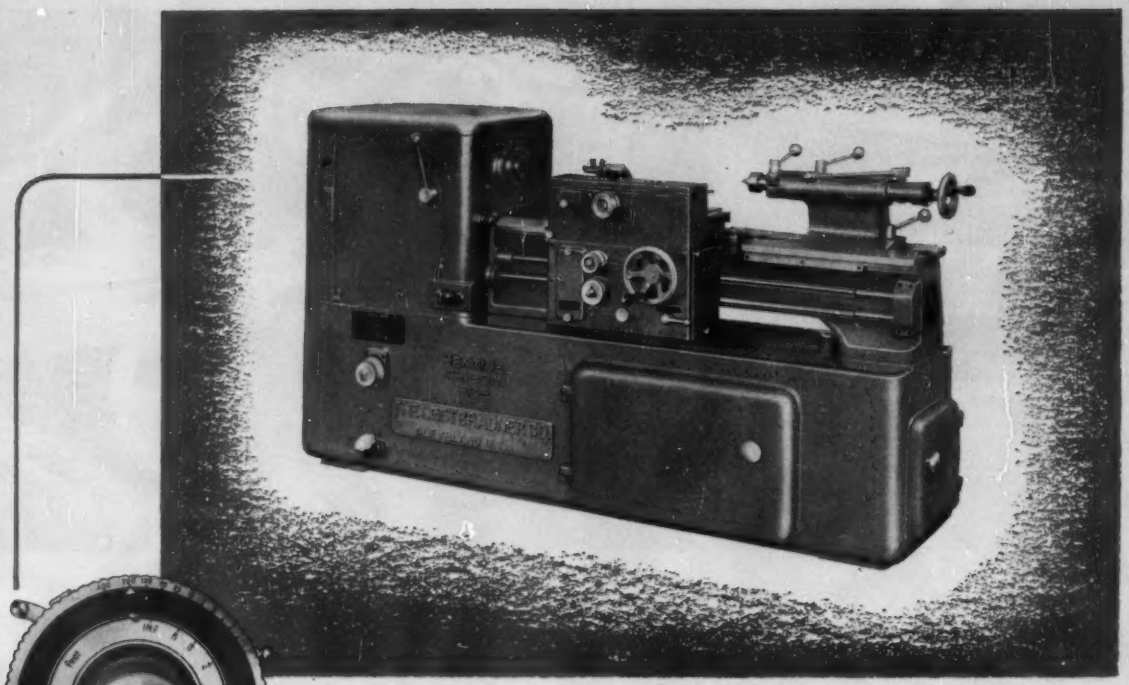
Tighten gib. Dresser now ready for action (drawing #3)

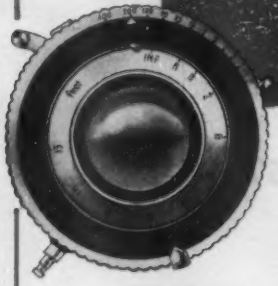
How much time and trouble can a J & S Wheel Dresser save you? Figure it up. Then write us for complete information.

J&S TOOL CO., INC.

WHEEL DRESSERS • JAW CLAMPS • PRECISION VISES • SINE BARS • DOWN-HOLDING DEVICES

646 W. Mt. Pleasant Ave., Livingston, New Jersey





CRI-DAN BRIGHTENS THE PRODUCTION PICTURE AT Eastman Kodak

Over a half-million lens mounts for Kodak cameras have been threaded on the Cri-Dan "B" during the past year. This fact, coupled with the extreme precision demanded in camera manufacture, dramatically proves that CRI-DAN Threading Machines combine accuracy and speed to an extent heretofore unknown.

Key to CRI-DAN's efficiency is the single carbide point tool which threads with unusual speed and accuracy. Changeover is fast and tool cost low.

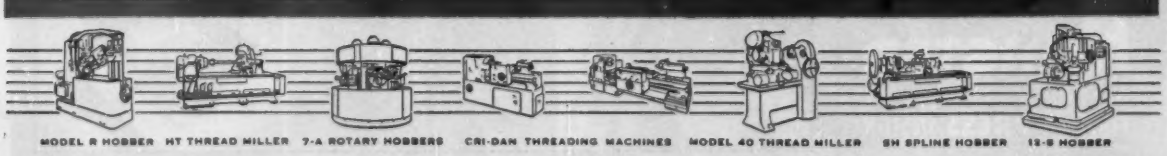
Take steps now to brighten your production picture. Get all the facts on CRI-DAN Threading Machines from your Lees-Bradner representative, or write direct.

CAPACITIES

Spindle Speed (In 24 Steps)	145 - 2800 RPM
Swing Over Saddle	4"
Swing Over Bed	13"
Capacity Between Centers	36"
Max. Thread Length	2½"
Max. Diameter Thread	4"
Rated Max. Capacity	10 TPI
Max. No. of Thread Starts	12
Max. Taper Thread	25° Incl.
Max. No. Passes Per Thread	32

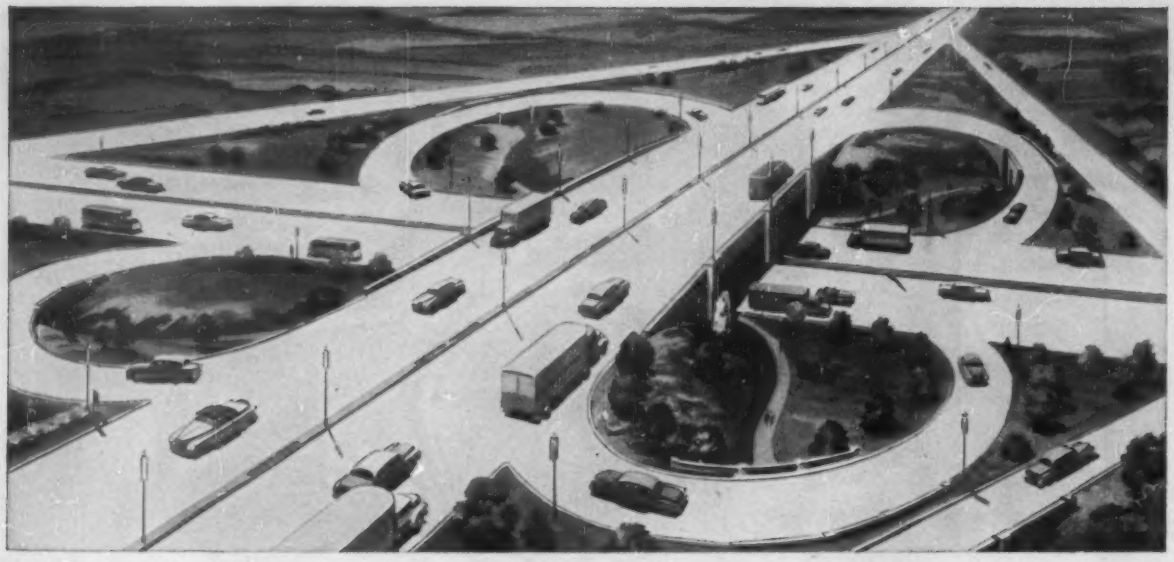
the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



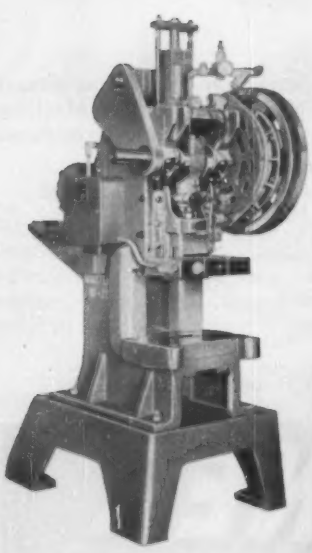
MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER



EFFICIENCY

...you get it with a Minster Press



■ Here's one big reason why you will obtain surprising results with a Minster Press—Minster's unusual degree of operating efficiency.

Engineered and built to do the job . . . high speeds available when they are useable . . . close control of tolerance . . . easy adjustment . . . accurate control . . . protection of dies and longer die life . . . lessened operator fatigue . . . remarkably little maintenance . . . yes, these are only a few well documented results of Minster press operation.

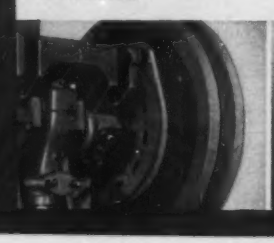
Check into Minsters for your own jobs. Set the standards high. You'll find Minster first in press efficiency because Minster is first in press design.

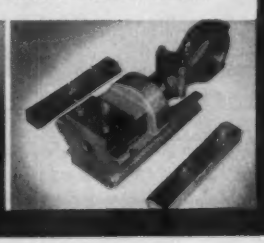
THE MINSTER MACHINE COMPANY, MINSTER, OHIO

CLUTCH
Minster's combination friction clutch and brake offers smooth, fast engagement . . . no overlapping action or drag . . . controlled operation as needed . . . exceptional friction surface life.

FIXED BASE
Minster's B1 press bases typify specialization for efficiency. Wide spread, close to the floor, and solid frame mounting take out sway and distribute shock of high speed feeding and stamping.

BRONZE GIBS
Long solid bronze gibs on fast gap presses require less clearance and permit more accurate slide alignment and velocity so necessary for high speed tooling. Extra long ways are another Minster feature.





MINSTER
FIRST IN **PRESS** DESIGN

U N O N

Precision was built into every detail of this Nineteenth Century clock.

Today, the finest gears are mechanically reproduced by means of precision-built hobs. For the best in hobs — demand precision hobs by Union.

Renaissance 19th Century French Clock, made in Paris by RAINGO, Circa 1840

HOBS

Involute Spline
Parallel Spline
Worm Gear
Tangential
Spur Gear
Helical Gear
Ground
Unground
Accurate Unground
Finishing
Roughing
Preshave
Protuberance
Stub-Tooth
Standard Gear
Composite Form
Combination Pitch
Topping
Semi-Topping
Non-Topping
Herringbone Gear
Shank Type
Shell Type
Serration
Square Shaft
Tapered Hole
Multiple Thread
Special Shape

SPROCKET

Silent Chain
Roller Chain
Special

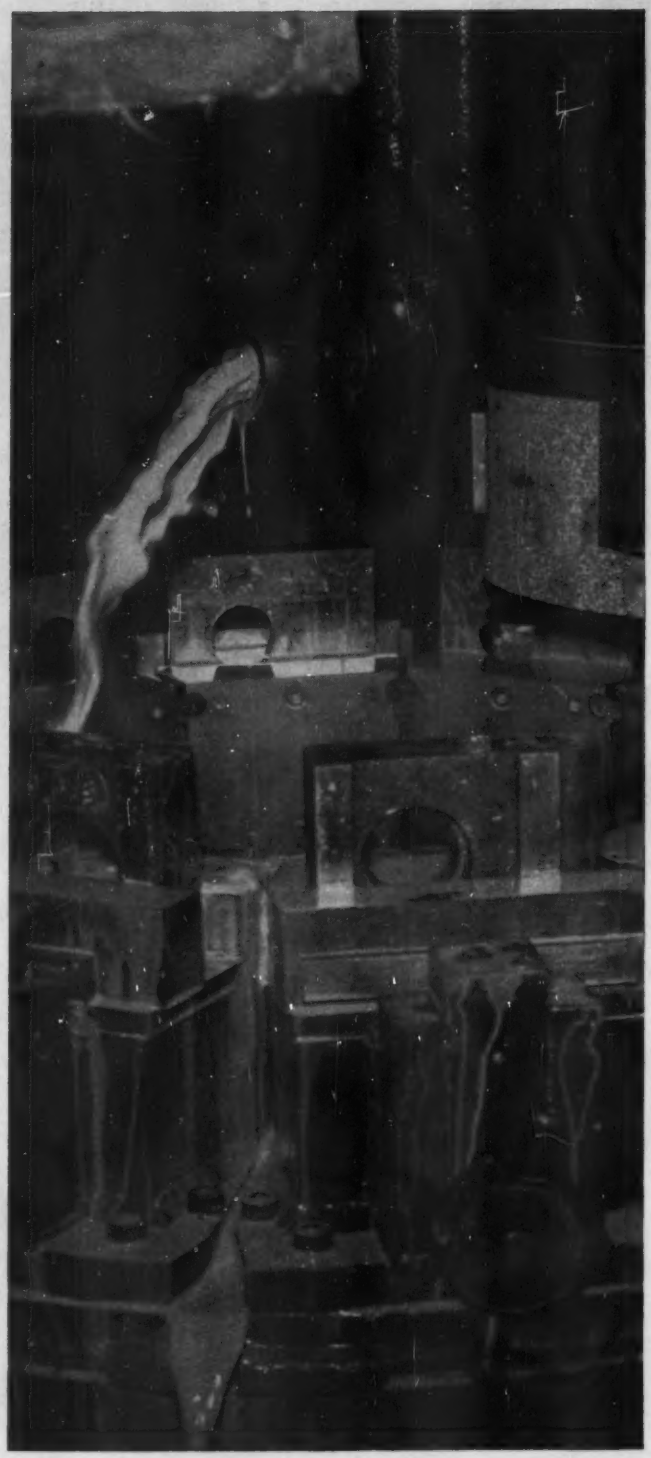
UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

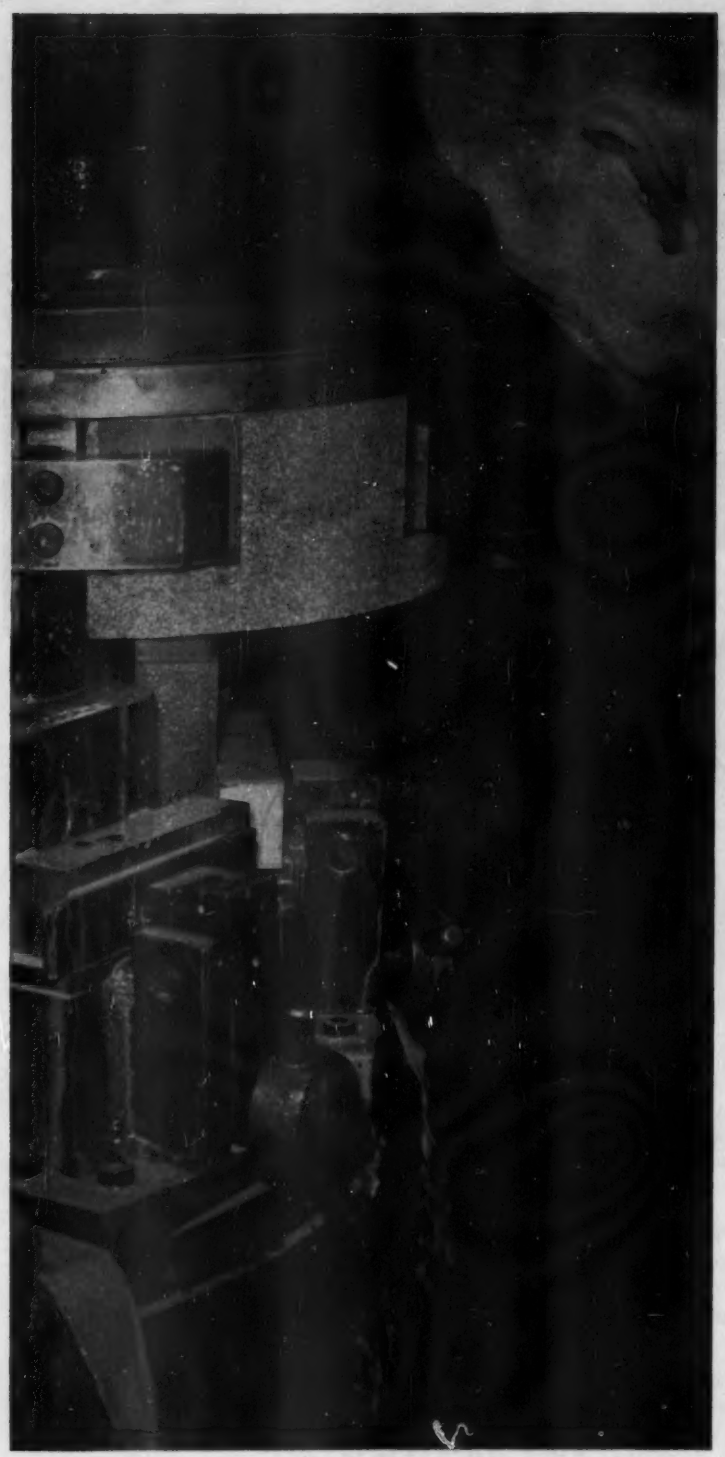
CUT INVENTORY COSTS, ORDER FROM YOUR LOCAL DISTRIBUTOR

V 20 BOND SEGMENTS



...help you produce closely controlled surface finishes at remarkably low cost—on nearly all types of metals, including non-ferrous

...continually putting more sense in your abr[illegible]ve do[illegible]



This customer saves $25 per wheel!

By changing from a premium-priced ring wheel to a Type CD18 Segmental Wheel with CARBORUNDUM's DA30-15-V20 segments, this user now removes 3/16" stock from two edges of 10 cast iron clappers in 30 minutes, holds tolerance to .005"... and *saves $25 on every wheel change.*

Only CARBORUNDUM's V20 Bond Segments offer all these advantages:

- **UNIFORM CUTTING AT HIGH RATES...** throughout the entire life of the segments.
- **COOL, FREE CUTTING** qualities that produce clean, undisturbed surfaces.
- **LESS DRESSING TIME...** because of the self-dressing, size-holding characteristics of V20 Bond.
- **EXTRA CUTTING LIFE...** through using harder grades without losing cutting effectiveness.
- **FEWER SET-UPS.** One grading grinds a large variety of materials successfully.

ASK YOUR CARBORUNDUM DISTRIBUTOR

or Salesman for details on V20 Bond Segments to suit your job. He's listed in the yellow pages under "Abrasives" or "Grinding Wheels" and he's always at your service with expert counsel on any grinding problem—plus prompt deliveries for every abrasive product you need. Or write to The Carborundum Company, Dept. AM 81-410, Niagara Falls, New York.

CARBORUNDUM

REGISTERED TRADE MARK

81-410

An Outstanding Advance
in PLUNGE FORM GRINDING

Sets New Records for Production and Accuracy . . . Reduces Costs . . . Replaces Other Methods for Producing a Great Variety of Work! Note These Advanced, In-Built Features!

- **Completely automatic cycle** — High speed approach, wheel feed spark out and withdrawal are positively controlled through simple cam action — ensuring constant, uniform operation under all conditions.
- **Automatic positive size control** — The wheel slide is held against positive stops with uniform hydraulic pressure.
- **Automatic trueing device** with controlled dressing.
- **Automatic or manual handling.**
- **Complete versatility** — chucking work, center work or shoe-type grinding; crush wheel or diamond trueing.
- **Compact design** — affords exceptional accessibility and simple set-ups.

P.S.

Write for illustrated folder — gives complete specifications and examples of how the Model "E" does jobs faster, better and more economically.

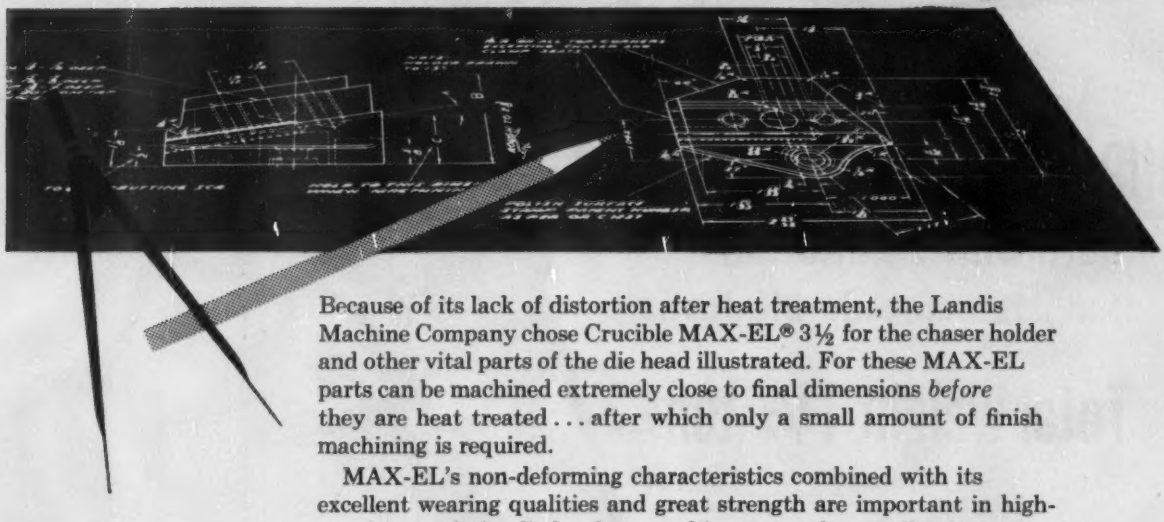
JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

J&L MACHINE TOOL DIV.

Non-deforming **MAX-EL** alloy steel parts require minimum finish machining



Because of its lack of distortion after heat treatment, the Landis Machine Company chose Crucible MAX-EL® 3½ for the chaser holder and other vital parts of the die head illustrated. For these MAX-EL parts can be machined extremely close to final dimensions *before* they are heat treated . . . after which only a small amount of finish machining is required.

MAX-EL's non-deforming characteristics combined with its excellent wearing qualities and great strength are important in high-speed turret lathe die heads . . . and in many other applications.

Your shop will benefit, too, from the ease of machining, freedom from distortion, superior quality and longer tool life you get with MAX-EL. To start taking advantage of MAX-EL *now, call Crucible.*

CRUCIBLE first name in special purpose steels

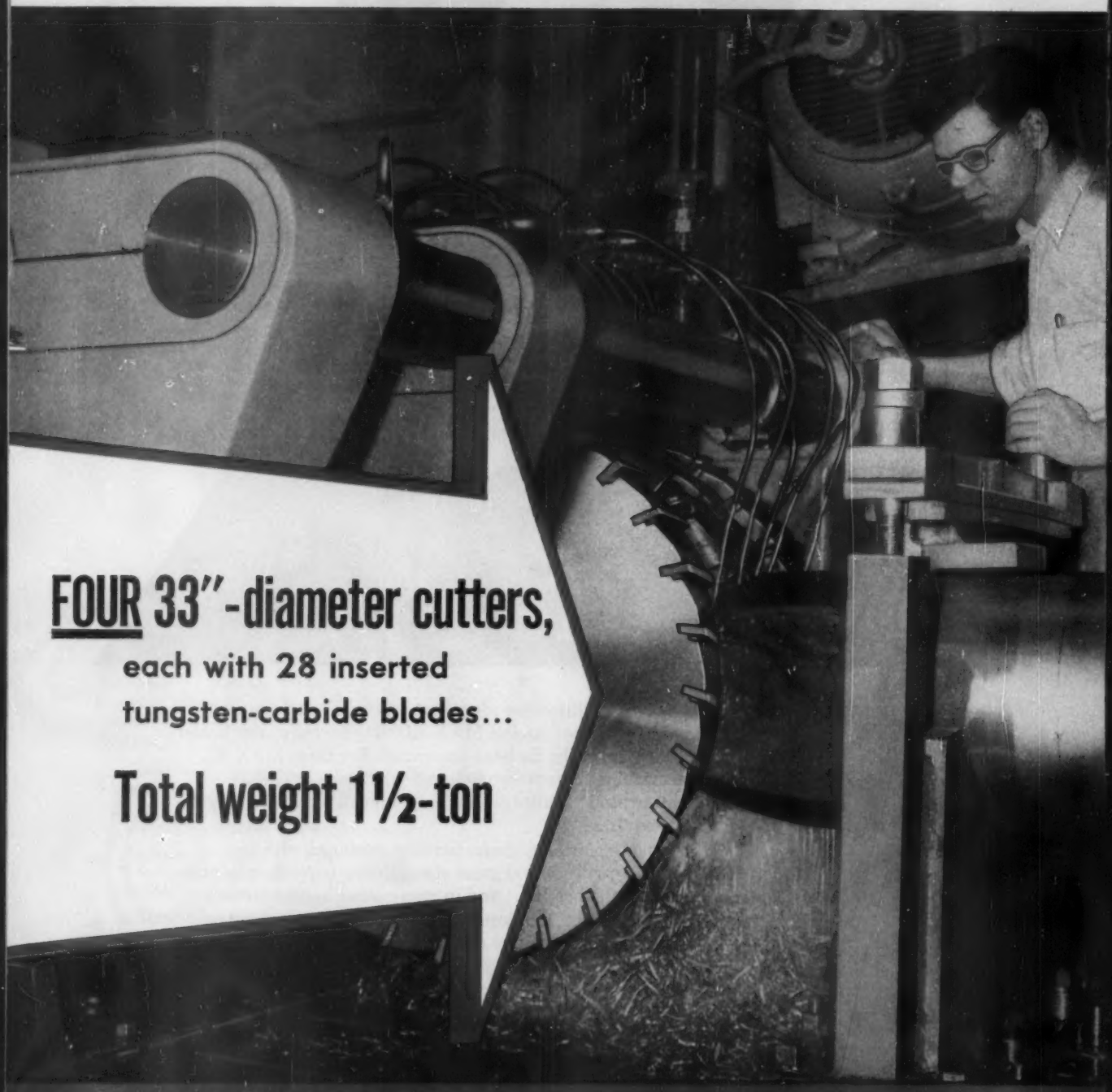
54 years of Fine steelmaking **ALLOY STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DAYTON DENVER • DETROIT • HOUSTON • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH PROVIDENCE • ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • ST. PAUL • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

Reducing diet



FOUR 33"-diameter cutters,
each with 28 inserted
tungsten-carbide blades...

Total weight 1½-ton

PRODUCTION DATA

Workpiece: steel forging.
Machine: 4208 Simplex Bed Type milling machine with 50-hp, No. 5 quill type spindle head.
Spindle Speed Range: 6-30 rpm.
Feed Range: ⅛ to 30 ipm.
Cutters: Four . . . 33 in. dia. . . . each with 28 inserted T. C. blades.

for 4-ton forgings

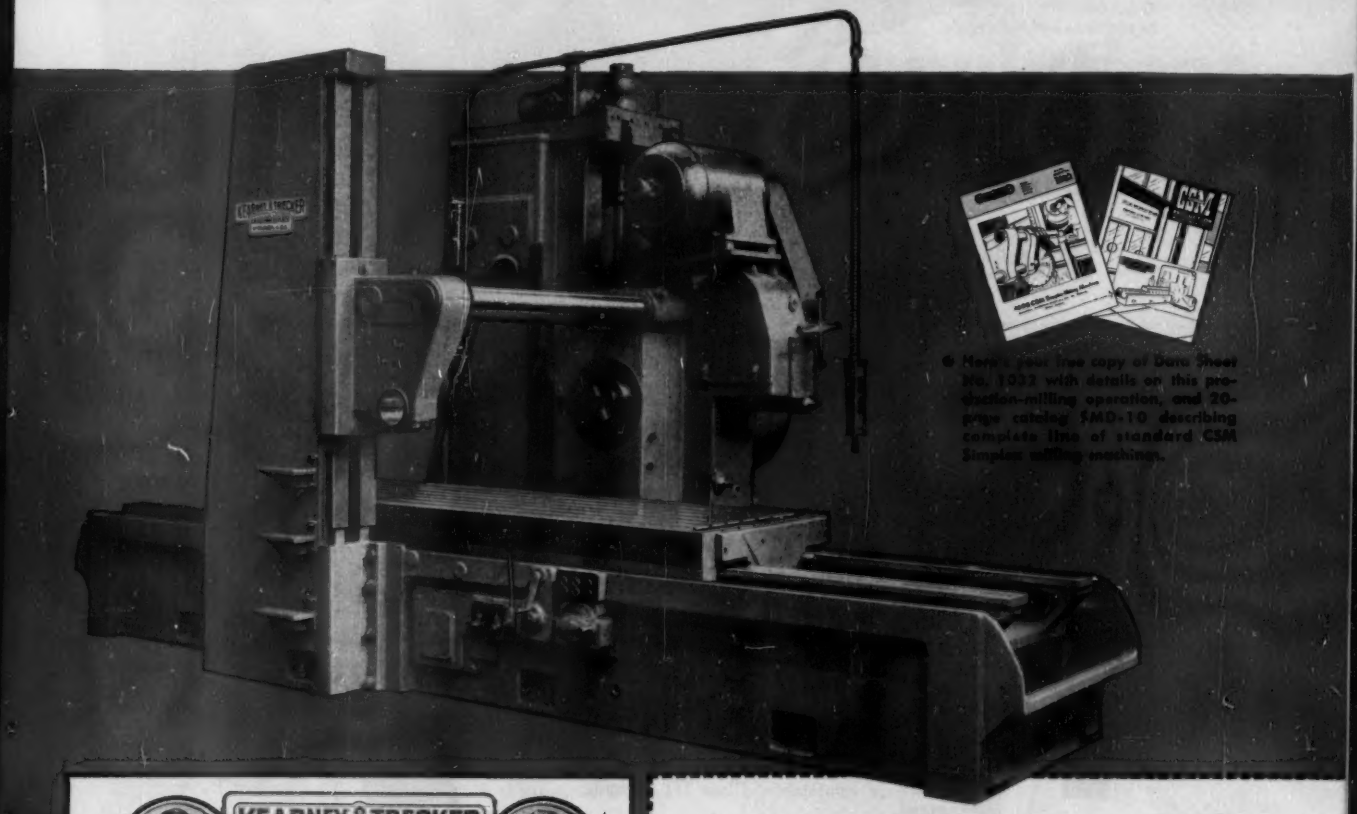
Kearney & Trecker's Bed Type, Model CSM milling machine removes maximum metal with four tungsten-carbide cutters

Here's your answer for increased capacity in the production-milling of large workpieces, like these 4-ton forgings.

It's the Kearney & Trecker 4208 CSM Bed Type Simplex machine. Because of its rugged construction and transmission of maximum power at the cutting tool, it was selected for milling both sides and a middle slot on 4-ton aircraft landing struts.

A special 50-hp quill type spindle head with a low-speed range of 6 to 30 rpm is used to drive four 33" dia. side-milling cutters, each with 28 inserted tungsten-carbide blades. Outstanding machine features include unit construction, combination 30" dia. spindle gear and flywheel, counterweighted head, double overarms for rigid arbor support and independent motor drives for spindle, feed, rapid traverse and coolant pump.

The machine upright, which carries the spindle head is of a full box-section construction with large way surfaces, designed to absorb vibration from the heaviest cutting loads. Rigidity to the large-diameter cutters is also provided by a heavy-duty outer arm brace.



Here's your free copy of Data Sheet No. 1032 with details on this production-milling operation, and 20-page catalog SMD-10 describing complete line of standard CSM Simplex milling machines.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Special Machinery Division

MILWAUKEE 14, WIS., U.S.A.

KEARNEY & TRECKER CORPORATION, *Special Machinery Division*
6784 W. National Avenue, Milwaukee 14, Wisconsin

Please send me Data Sheet No. 1032 and 20-page catalog SMD-10. ☐ Check here if you would like to have a representative call on you as soon as possible (or call Milwaukee, GReenfield 6-8300).

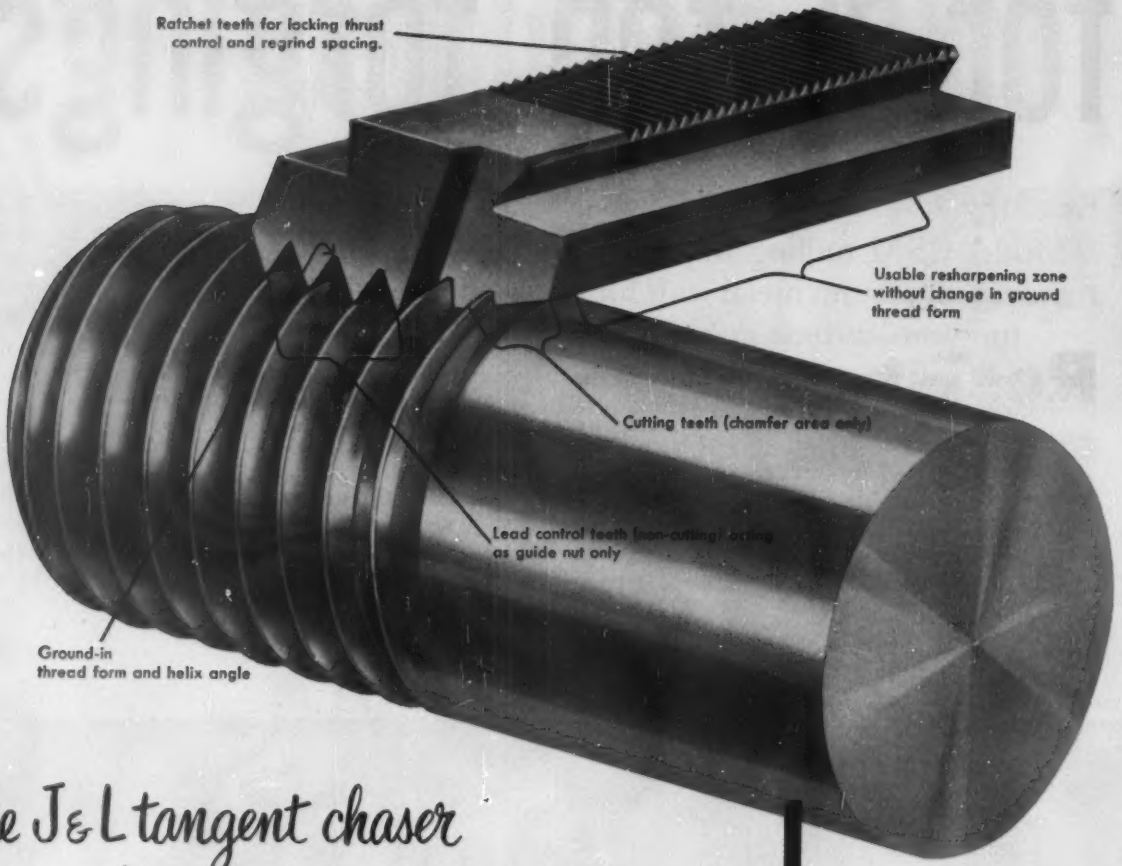
Name.....

Title.....

Company.....

Address.....

City.....Zone.....State.....


Ratchet teeth for locking thrust control and regrind spacing.
Usable resharpening zone without change in ground thread form
Cutting teeth (chamfer area only)
Lead control teeth (non-cutting) acting as guide nut only
Ground-in thread form and helix angle

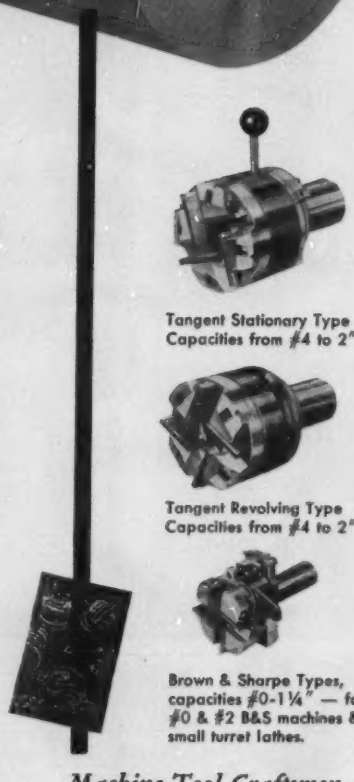
the J&L tangent chaser threading System assures...

... ease of operation ... maximum accuracy and tool economy — by means of a true tangent method of thread cutting exclusively developed by Jones & Lamson.

All four chasers in the set are positioned tangent to the work, making them cut like any other end cutting form tool. J&L tangent chasers have the thread form ground in at the exact helix angle for the size and pitch being threaded. Cutting action is confined to the chamfered area and the first full tooth in a set. The non-cutting teeth, purposely end ground above center, act as a precision lead nut. The non-cutting teeth on all four chasers act as a steady-rest and help control the lead with extreme accuracy. Class III guaranteed. *This means important savings regardless of your tolerance requirements.*

J&L Automatic Opening Die Heads and Chasers assure low initial cost — ease of operation — controlled resharpening — use of carbide where applicable. Class III threads guaranteed.

Write for free copy of *new* Jones & Lamson Tangent Die Head OPERATOR'S MANUAL.



Tangent Stationary Type
Capacities from #4 to 2"

Tangent Revolving Type
Capacities from #4 to 2"

Brown & Sharpe Types, capacities #0-1¼" — for #0 & #2 B&S machines & small turret lathes.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

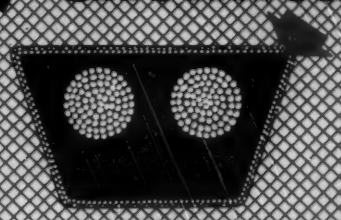
JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

J&L THREAD TOOL DIV.

TEXROPE
High Capacity
V-BELTS

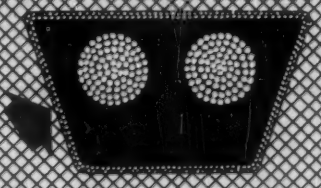
Resist Oil, Weather, Chemicals

Neoprene is used in *Super-7* High Capacity Belts for extra protection. Result — a strong, tough belt for use inside or out under adverse conditions.



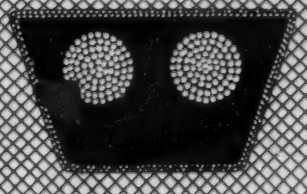
Eliminate Static Accumulations

Super-7 High Capacity Belts are made with a special rubber compound. This permits flow of static electricity throughout the belt to properly grounded sheaves.



40% more Pulling Power

Built for the tight spots where you may want to cut the number of sheave grooves . . . or the tough spots where for some reason ordinary belts fail.



FREE Sound Slidefilms

Valuable information for engineers, operating personnel, maintenance men.

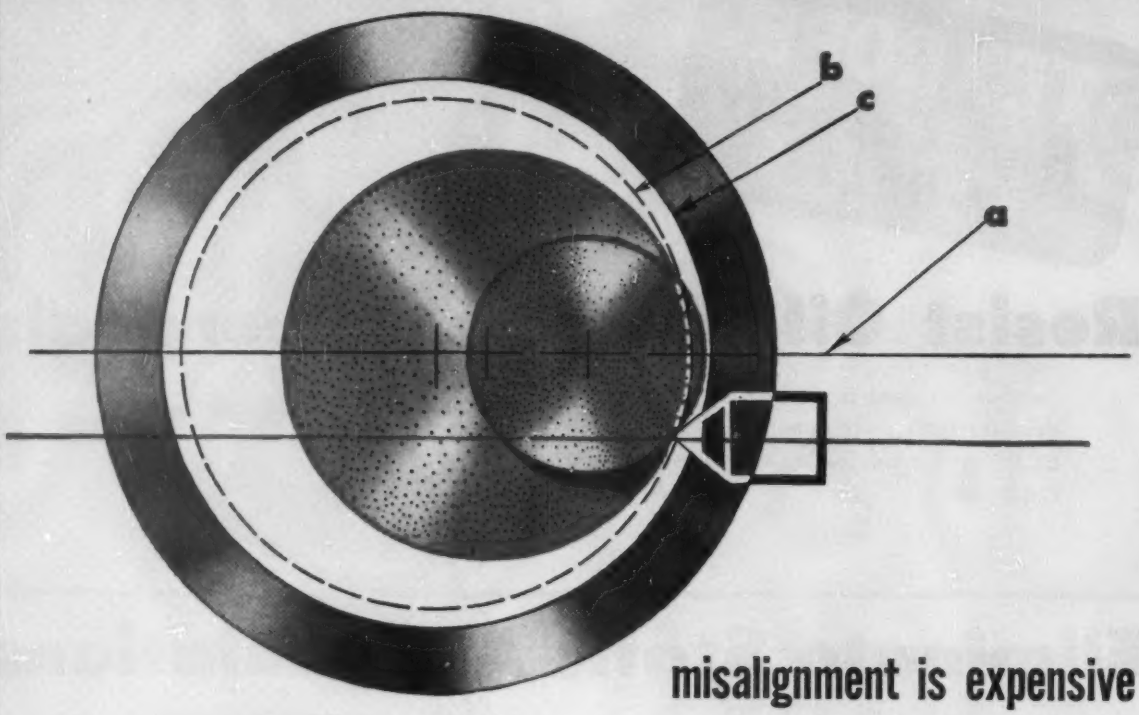
- V-belt drive principles
- V-belt drive selection
- V-belt drive maintenance

Call your nearest Allis-Chalmers Office or *Texrope* Drive Distributor to arrange a showing. Or write Allis-Chalmers, Milwauke 1, Wisconsin. A-4412

Texrope and *Super-7* are Allis-Chalmers trademarks.

A-C
ALLIS-CHALMERS

ALLIS-CHALMERS



misalignment is expensive

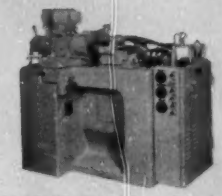
...Bryant controlled alignment

IF the internal grinder is to generate straight holes within precision tolerances, on a production basis, the various elements of the machine must be properly aligned. The axis of the work, the axis of the wheel and the diamond must lie in a plane parallel with both traverse and cross feed ways. Then the direction of feed will coincide with a line from the center of the workpiece to the point of contact between the wheel and the work. In addition, the wheel will be dressed in line with its point of contact with the work regardless of the size of the wheel.

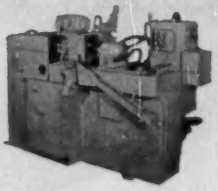
In the illustration above, these requirements are not met because the diamond is below plane "a" which is established by the work center line and wheel center line. The drawing shows the grinding wheel at its largest diameter (new) and also at its smallest diameter (worn). The center lines of wheel and work remain in plane for the life of the wheel and the position of the diamond remains constant for the life of the wheel. When diamond sizing, the work, or wheel, is fed to a series of predetermined positions,

Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie—free showings arranged for engineering groups.

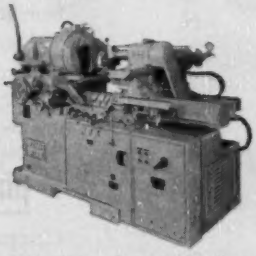
no. 1109 9" swing, semi-automatic



no. 1309-W 9" swing, 2 spindle semi-automatic

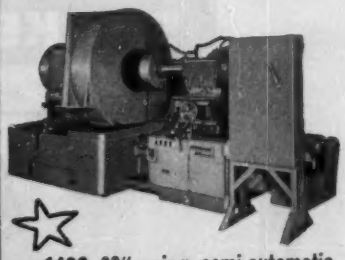


no. 2209 9" swing, automatic



no. 1116 16" swing, semi-automatic

no. 3216 16" swing, automatic



no. 1460 60" swing, semi-automatic

The Bryant 1460 Hydraulic Internal Grinder is designed to handle a variety of large work pieces such as bearing races, connecting rods, dies, up to 60" in diameter. Outside diameters and faces may also be ground. This semi-automatic machine will grind straight and tapered holes to a maximum depth of 16". The workhead can be swiveled to grind tapers up to 60° included angle using the full 60" swing or at any desired angle beyond 60° included angle at slightly less than 60". The bore of the work spindle is 9" in diameter to allow long work pieces to extend through the work spindle if required. Adjustment is provided under the rear of the wheelslide to insure straight line motion of the wheel. Write for folder.

gives better internal grinding

advancing a fixed amount from one workpiece to the next to compensate for wheel wear. As the wheel wears down it will continue to contact the work in plane "a". However, because the diamond is below plane "a", which is also the direction of feed, the new wheel contacts the work slightly beyond the diamond and generates hole "b". As the wheel wears down, the contact point with the work advances further beyond the diamond until hole "c" is generated. In short, the hole finished by the new wheel will be one size, but the worn wheel will remove too much stock and the hole will be oversize.

This is one of the reasons that some internal grinders, when set up for diamond sizing, will not hold size during the life of the wheel. In diamond sizing, uniform holes can be produced only by careful setting of the work center, wheel center and diamond in one plane (plane "a"), which must be parallel with both traverse and cross feed ways. Finish size will then be correct regardless of wheel diameter.

see our catalog in MACHINE TOOL CATALOGS or write for copy

Bryant Chucking Grinder Co.

Springfield, Vermont, U. S. A.

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

FOR PLANNING AIDS P-K Engineering Data meets every need of design, project, and methods engineers, gives anyone concerned with planning assemblies complete, clear, concise information. P-K Price Data speeds ordering routine, prevents errors. The P-K Socket Screw Dimension Finder shown in use is a pocket size plastic slide chart that gives all needed dimensions at a glance.

Look Beyond the Hex

The hex socket identifies all socket screws, but beyond the hex there's a big difference. If you have never tried P-K Socket Screws you are blocking your way to *proved* benefits other buyers are using to advantage.

Look *beyond* the hex. For example, until you see P-K product information, you'll have no idea how helpful it is . . . how much time it saves . . . how much easier it makes the job.

It pays to know the difference

Compare every detail of product and service. You'll find P-K Socket Screws take top rating by every test.

For cost-wise assembly, you need all these advantages. Why miss out on any of them? Try P-K Socket Screws. Get samples, information from your P-K Distributor or write: Parker-Kalon Division, General American Transportation Corporation, 200 Varick St., New York 14.

FOR ADVANCED DESIGN that speeds assemblies — makes them simpler, stronger — and saves errors.

FOR ASSEMBLY STRENGTH okayed in a million punishing tests by thousands of satisfied users.

FOR PLANNING AIDS and buying data patterned to your special needs, plus advice on assembly.

FOR SUPPLY SERVICE set up for fast action and lower purchasing expense — by local Distributors.

FOR ANY STYLE OR SIZE You'll find any Socket Screw you need in P-K's complete line. Hex Keys in all sizes, and several handy sets.

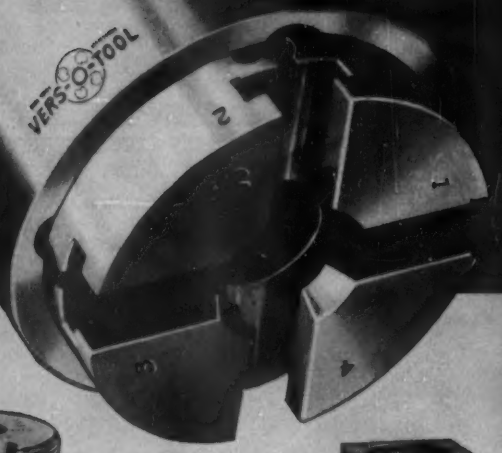
PARKER-KALON SOCKET SCREWS

GET ALL THESE ESSENTIALS OF COST-WISE ASSEMBLY GET P-K

In Stock . . . for immediate delivery . . . see your nearby P-K Socket Screw Distributor

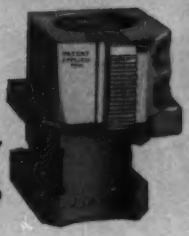
VERS-O-TOOL

CHOICE



A

CIRCULAR GROUND THREAD CHASER
HEAD SIZES: 3/16 - 6½"



ADJUSTABLE BLADE CHASER
HEAD SIZES: 3/8 - 2"

B

It's this simple...you start with a precision built self-opening die head —the Vers-o-tool—then just choose either of two types of chasers least costly for the job.

A If it is a long run job—specify circular ground thread chasers. They give you maximum chaser life by any comparison, regrind to a full 270° circumference. Up to 10,000 threads per grind on screw stock isn't unusual.

B For smaller lot threading—use the Namco Adjustable Blade type chasers, also with ground threads.

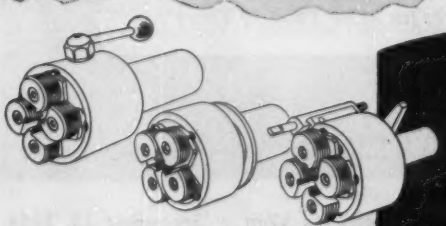
Both styles are interchangeable, head size for head size, between revolving and non-revolving Vers-o-tools.

ONE VERS-O-TOOL and SELECTIVE CHASERS . . .

cuts your threads . . .
cuts your tool investment
and cuts your operating costs

This system also includes a Namco Micrometer Gage, which checks the chasers—does away with trial cuts after grinds, gives many more pieces per grind, reduces reject losses and saves wasting expensive man-hours. Class 3 threads are guaranteed—and smoother.

Every month, more threading departments join our lists of exclusive Vers-o-tool users. Maybe you'd like to try out this double-duty head. If rising costs are your problem—you should. Send a sample with "specs," large or small run, and we will show you. Ask for Catalog DT-52.

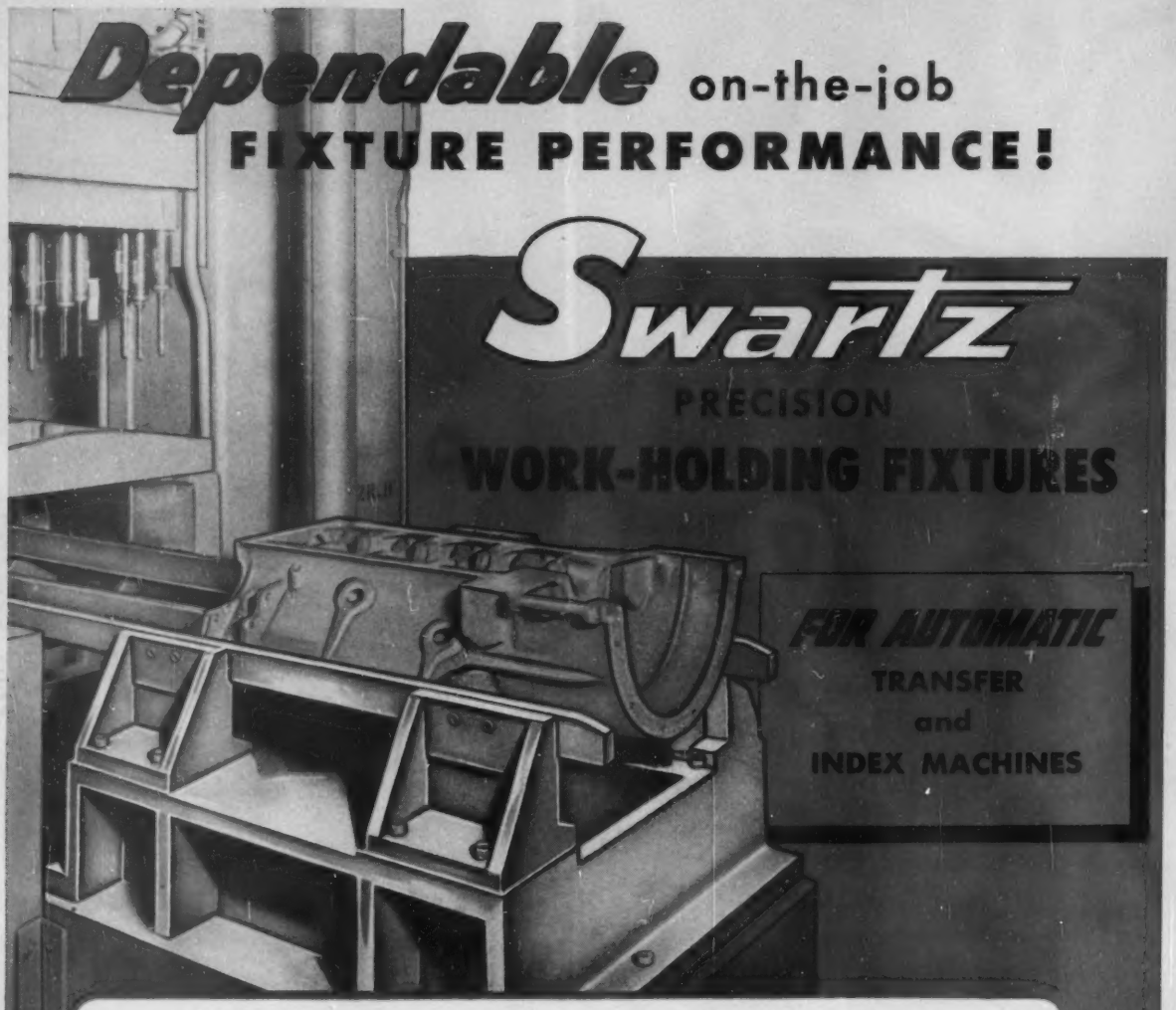


The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing.

Dependable on-the-job FIXTURE PERFORMANCE!



It's the dependable on-the-job performance of Swartz fixtures which sums up the many advantages Swartz service provides both buyer and builder of automatic machine tools. That's why Swartz fixtures were specified for this special 14-station Transfer Machine.

More than 30 years of seasoned experience and know-how, together with modern fixture-building facilities, are back of the Swartz specialized fixture-building service. It is an out-of-the-ordinary service, complete in every detail, with a number of distinct advantages . . . advantages it will pay you to investigate.

A Swartz engineer will gladly give you the facts, and point out the many ways this efficient, profitable service can be put to work for you.

WRITE TODAY FOR YOUR COPY OF THE NEW SWARTZ BROCHURE! THE INTERESTING DETAILS OF SWARTZ SERVICE ARE OUTLINED IN THIS NEW BROCHURE, "ADVANCING AUTOMATION," AND A COPY WILL BE MAILED ON REQUEST.

Designers and Builders of Precision Work-Holding Fixtures for More Than 30 Years

SWARTZ TOOL PRODUCTS
Division of Jefferson Corporation
[illegible] POLEY AVENUE • DETROIT 27, MICHIGAN

This Month's

GEAR PIX

HIGH SPEED HOBBERS—Michigan Tool's improved 1458-A Ultra-Speed gear hobbers are being used in ever increasing numbers in the gear industry. This battery of Ultra-Speed hobbers being assembled are the fastest single spindle hobbers made today.

COARSE PITCH GEARS—A typical 3½ pitch 10-inch diameter gear with a 1⅞ inch face width is cut on this heavy duty SHEAR-SPEED® gear shaper in less than 3½ minutes. Over five pounds of chips are removed in the process.

MICHIGAN TOOL COMPANY

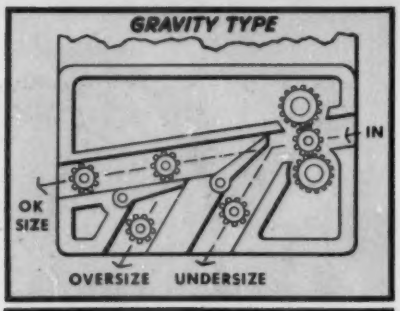
7171 E. McNICHOLS RD. • DETROIT 12, MICH.

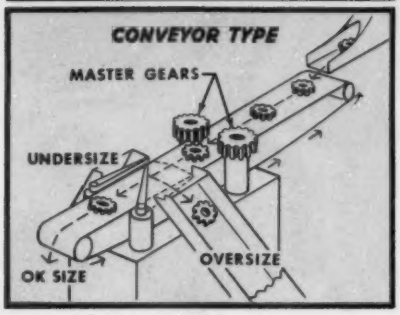
IN CANADA: COLONIAL TOOL CO., LTD

Over

This Month's

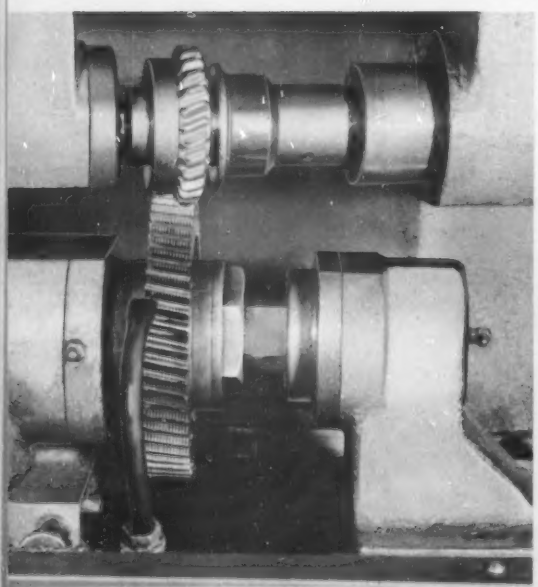
GEAR PIX



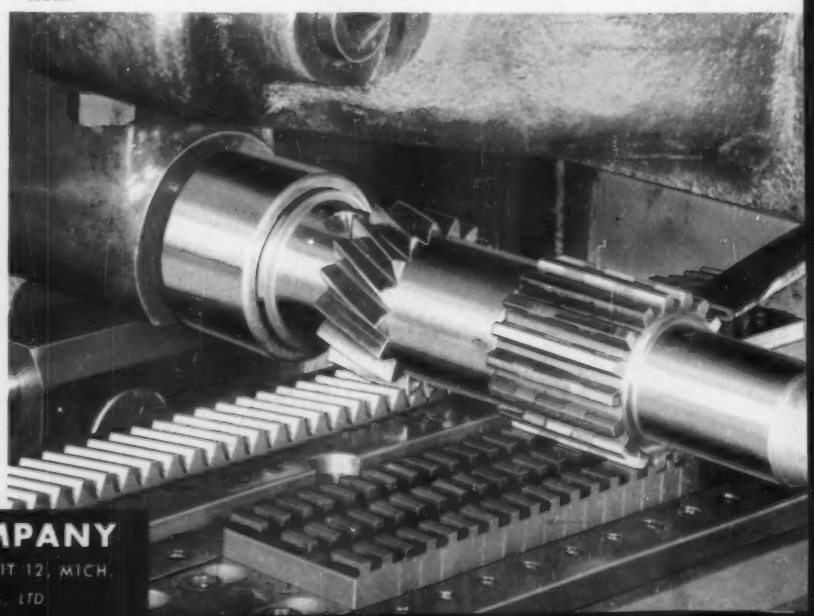


GEAR SELECTORS -Gravity and conveyor-type systems, custom made for size-checking of gears, are available in the new automatic 3-WAY gear selectors. Automatic shut-offs can be incorporated into selectors located in a production line with full automation or one in which the operator feeds the gears manually. 3-WAY selectors can be used to inspect any spur or helical gear at a much more rapid rate than gear cutting or finishing machines can turn out gears.

ANNOUNCING –The SINE-LINE® model 1136 involute checker capable of handling large external and internal spur or helical gears up to 36-inch diameter, with a maximum spread between centers of 26 inches, has been added to the Michigan line of checking equipment. This checker may also be used to check tooth spacing. Checking principle is based on a single master disc, combined with a sine bar. No extra base forms or master base circle discs are required.



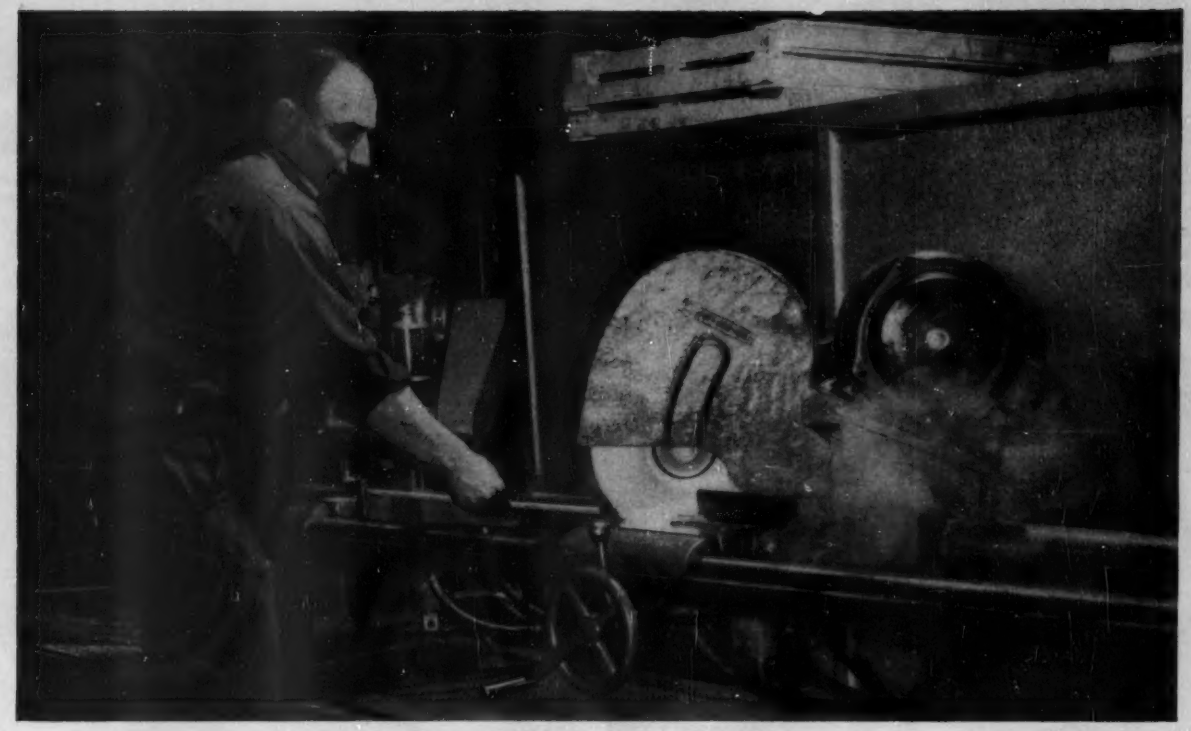
STEP SHAVING –Alternately thick and thin steps on the tooth faces of this splined main drive shaft are shaved in a two minute cycle on a Michigan 900 rack type gear finisher. A master rack, offset relative to the shaving rack, guides the master helical gear mounted on the work arbor, in progressively removing 8 to 12 thousandths of metal to form steps in the face of the spline teeth.



MODIFIED UNDERPASS SHAVING
Modified underpass method shaves this tough steel sliding low and reverse gear in 30 seconds. A Michigan 870 Underpass gear finisher easily handles 120 of the 3.833" O.D. and 0.735" face width gears every hour.

MICHIGAN TOOL COMPANY
7171 E. McNICHOLS RD. • DETROIT 12, MICH.
IN CANADA: COLONIAL TOOL CO., LTD.

Over



Aluminum Air Seal Mfg. Co. Reports:

"OUR PROBLEM WITH GRAVITY OILERS WAS SOLVED BY CITIES SERVICE CUTTING OIL!"

When flow of oil from gravity oilers was restricted by gum formation and residue, Aluminum Air Seal Mfg. Co. switched to Cities Service Chillo #22 Cutting Oil. Results: Plenty of oil flow, increased saw life, cleaner finish cuts!

Here's the report as Cities Service received it from D. C. Cover, Plant Supt. of Aluminum Air Seal Mfg. Co.:

"For the past three years we have been using your Chillo #22 with excellent results.

"Prior to that time, we experienced considerable trouble because our gravity oilers were not functioning properly due to residue and gum formation which restricted the flow of cutting oil to the saw. Consequently, this inadequate supply of cutting oil permitted excessive wear which, of course, greatly reduced our saw life.

"At this time, a Cities Service Lubrication Engineer called on us and recommended Chillo #22 as a solution to this problem. Not only was the problem of adequate supply eliminated but we found the oil gave excellent saw life as well as clean finish cuts.

"As you know, we supply aluminum stock to Trim-a-Seal plants throughout the country. *Whenever a new plant is set up we recommend that they use your product for cutting because we know it will do the job.*"

If you'd like to learn more about the oil "we know will do the job," contact your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

EXAMINING ALUMINUM EXTRUSION, an Aluminum Air Seal employee observes clean cut made with help of Cities Service Chillo #22 Cutting Oil. Firm supplies aluminum stock to 25 Trim-a-Seal plants throughout country.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

What's the Best Fixed Gage For the Job?

Some tips from Taft-Peirce on the various types of fixed gages. Relative cost and wear resistance information will be furnished on request.

Plain Gages

T-P Cylindrical Plug Gages come in 5 progressively greater wear resistances: Standard Hardened Steel, Electrolized, Chromium Plated, Tantalum or Tungsten Carbide, Norbide. Pilots: Progressive, Emmerton Ball Bearing, Taft-Peirce.

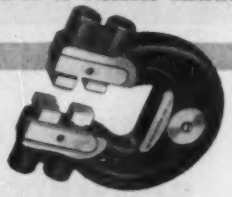
T-P External Ring Gages also come in 5 progressively greater wear resistances: Standard Hardened Steel, Electrolized, Chromium Plated, Tantalum or Tungsten Carbide, Norbide, for exceptional resistance to wear.

T-P Adjustable Snap Gages are available with gaging pins, round or square buttons, and regular or midget frames. Gaging members of high chrome alloy steel, Cemented Carbide or Norbide inserts.

Thread Gages

T-P Limit Thread Plug Gages are available with Taper Lock or Trilock design. In Standard Hardened Steel, Electrolized, or Carbide for exceptional wear resistance.

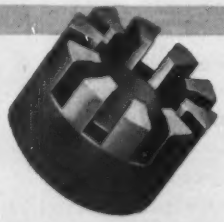
T-P Thread Ring Gages Simple unit clamping device simplifies setting, increases accuracy, eliminates distortion. Locks without changing pressure on ring.



T-P Adjustable Thread Snap Gages Available with Tungsten Carbide anvils. Roll Thread Snaps give longer service life. Gaging members rotate to spread wear over greater surface.

Special Gages

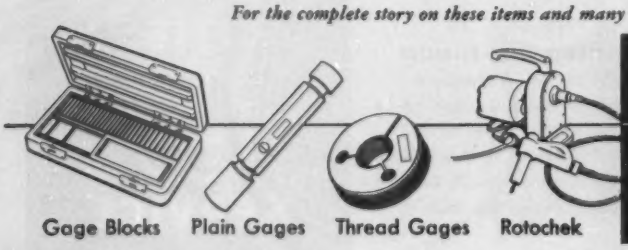
T-P Taper Plug Gages are made to both standard and special tapers. Like T-P Taper Ring Gages they can be made in a wide variety of materials to fit the job.



T-P Spline Gages, male and female, are made to individual requirements. Thousands of such special gages are made at Taft-Peirce every year.

T-P Special Snap Gage checks narrow groove in large diameter shaft. Another typical example of the wide variety of special gages made at Taft-Peirce.

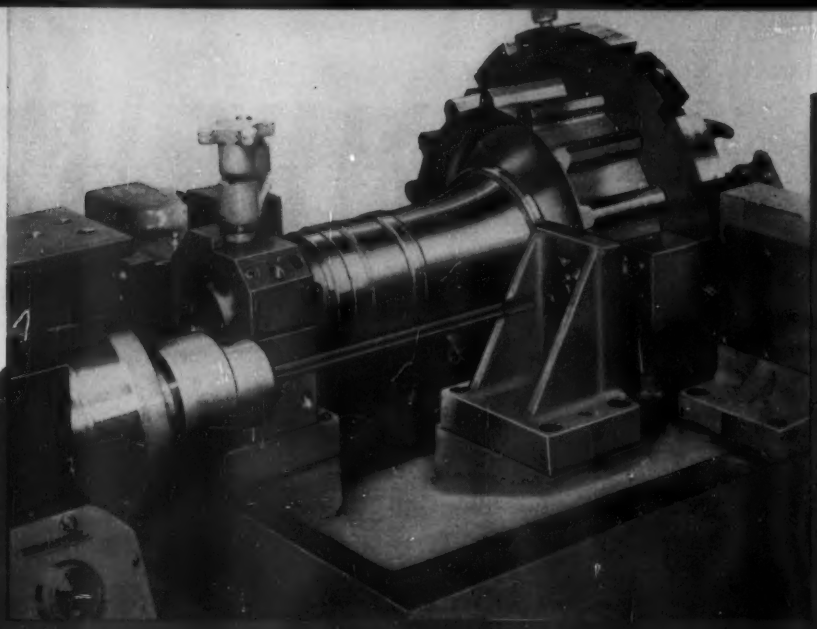
For the complete story on these items and many more, send for your copy of the Taft-Peirce Handbook.

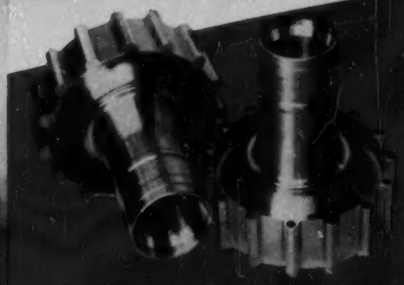


Gage Blocks Plain Gages Thread Gages Rotochek

T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.





S.A.E. 4340 aircraft part before and after 15 Bor-Dril holes. Hole size and location are held within plus or minus .001".

The workpiece is clamped in an arbor having an index plate. Note the gun drill about to enter the guide bushing. Holes are ¼" diameter, 3½" long.

EX-CELL-O ANNOUNCES BOR-DRIL

THE MODERN APPROACH WITH GUN-TYPE DRILLS

Ex-Cell-O Precision Machines are ideal for Bor-Dril machining of close-limit holes from the solid because of their smooth, easily-adjusted feeds and vibration-free construction.

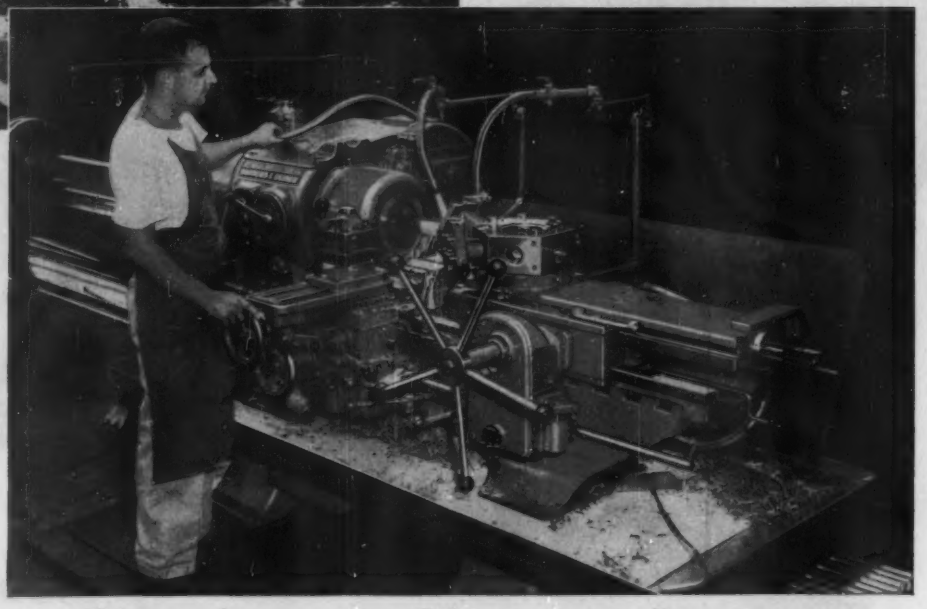
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

XLO

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

ARE YOUR MACHINE TOOL COSTS TOO HIGH?

No. 7 Lathe installed at the large Florida Division Plant at Lakeland, Florida.



Write for Catalog covering specification on the No. 7 Lathe

fmc

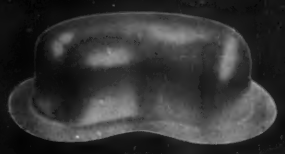
Food Machinery & Chemical Corporation takes the "BITE" Out of Machine Tool Costs...

Mr. Howard L. Shannon, Division Manager, Florida Division of Food Machinery and Chemical Corporation says, "The one factor which particularly influenced our selection of Bardons & Oliver equipment was the availability of a machine capable of handling a 4½" diameter bar through the head stock with a reasonable capital investment. In our shop our loading is normally comparatively light, which makes it difficult for us to justify a heavy fixed investment in tools, and in this machine we were able to procure a new tool with no greater investment than might have been required for a reconditioned tool of comparable capacity in any one of several makes."

MANUFACTURERS OF A COMPLETE LINE OF TURRET LATHES AND CUTTING OFF LATHES

BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO



One operation
0.064" 24SO Aluminum

One operation
0.051" 24SO Aluminum

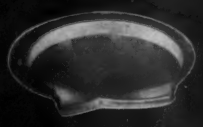
One operation
0.064" 61SO Aluminum

Drop Hammer combined with one Hydroform operation.
0.064" 61SO Aluminum

One operation
0.040" 75SO Aluminum

One operation
0.025" RC70 Titanium

◀**CINCINNATI HYDROFORM MACHINES AT NORTH AMERICAN AVIATION, Inc. 26" machine in foreground, 12" machine in background. For a description of the Hydroforming process and specifications of the 8", 12", 19", 23", 26", and 32" machine sizes, write for Bulletin M-1759-3.**



One operation
0.051" 61SO Aluminum

Two operations
0.040" 61SO Aluminum

Two operations
0.032" 52SO Aluminum

Three operations
0.032" 61SO Aluminum

These are typical aircraft components produced on two *Cincinnati Hydroform* machines at North American Aviation, Inc. Hydroforming has increased their overall production of intricately-shaped parts . . . made from all types of materials ranging from aluminum to titanium . . . at *very substantial savings* in development and production time, in tooling, material and labor costs.

To determine if Hydroforming can produce similar savings for your manufacturing program, call a Cincinnati Milling field engineer.

One operation
0.051" 61SO Aluminum

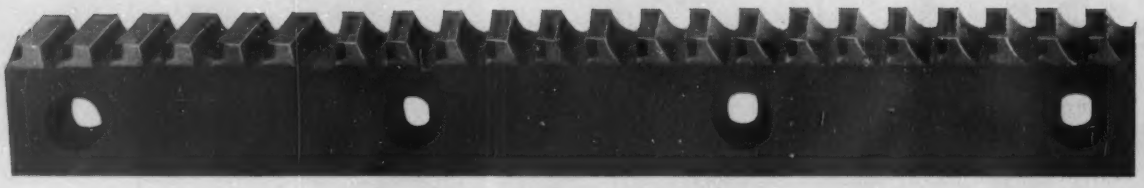
CINCINNATI

Hydroform

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.

One operation
0.064" 61SO Aluminum

Now Form Relieved For Intricate Shapes in

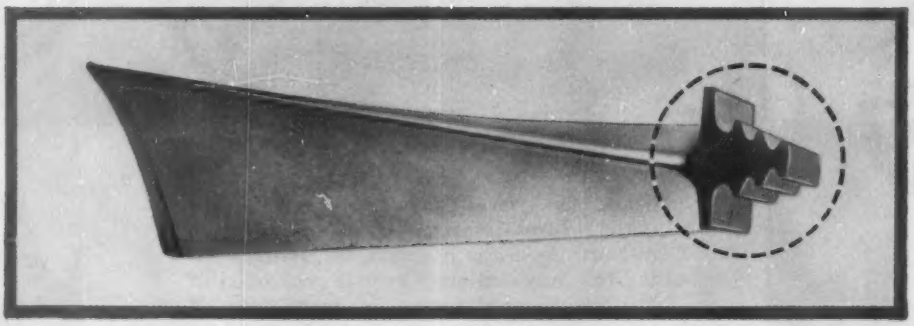


Another USB FIRST

U. S. BROACH COMPANY has developed for the first time . . . Completely Form Relieved Carbide Broaches.

Intricate shapes can now be broached in materials previously considered "non-broachable." Critical size and finish tolerances are productively maintained in one simple broaching operation.

Our engineers, with their many years of experience in high speed and carbide broaching, are ready to assist you with your individual broaching problems. Experienced field engineers are available in most areas.

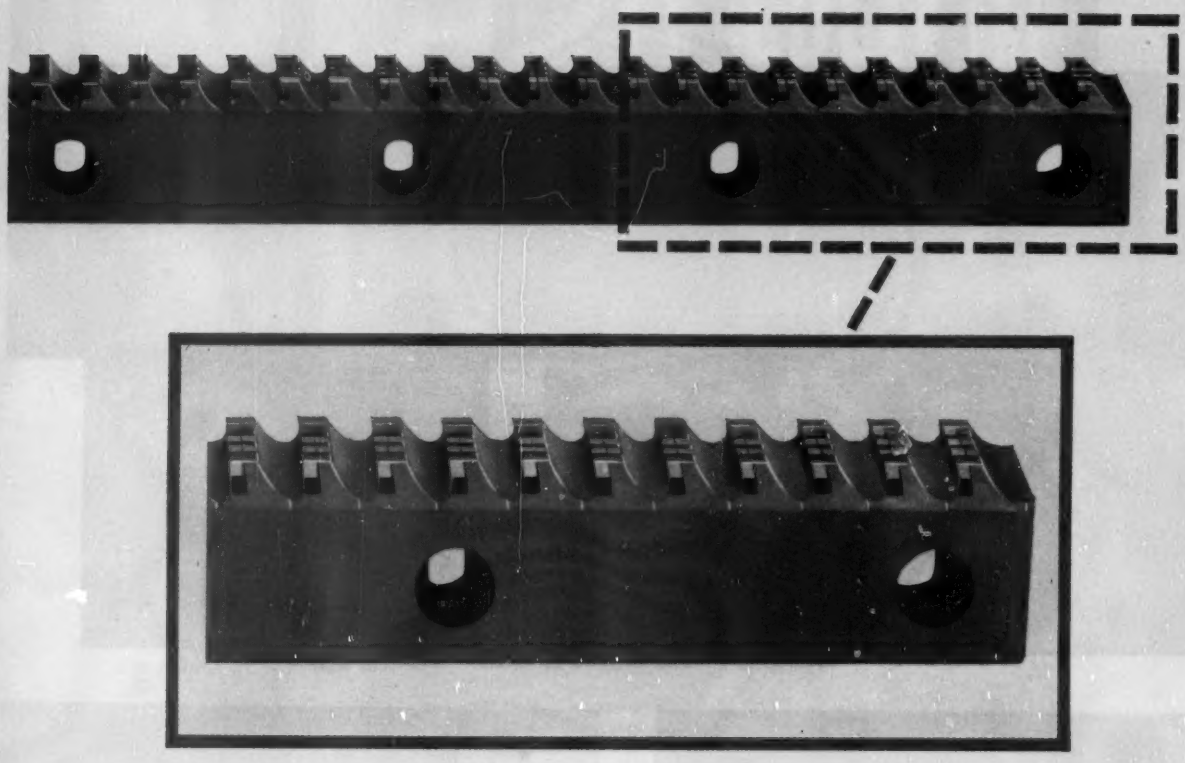


Actual size photograph shows form (circled) produced at root end of jet engine turbine blade by the carbide broach illustrated. Material broached was AMS 5382 Alloy.

U. S. BROACH COMPANY

CARBIDE BROACHES

Extra-Hard Alloy Steels!



ACTUAL SIZE

This photograph shows a typical example of the complex forms now being produced by the Carbide Division of U. S. Broach Company. Designers and manufacturers of all types of carbide and high speed steel broaches.

Designers and Builders of complete broach tooling
Catalog upon request

USB

6463 E. SEVEN MILE ROAD • DETROIT 34, MICHIGAN

HOLES

costing too much?

NOT WITH CLEEREMAN

DRILLING MACHINES

Low cost holes require working drills at top efficiency. The built-in capacity and power of Cleereman Drilling Machines is greater than needed today with reserve for the tools of tomorrow.

- ✓ **Operate at maximum speeds**
- ✓ **Operate at maximum feeds**
- ✓ **Operate with maximum convenience**
- ✓ **Operate with minimum maintenance**

There is an enthusiastic user near you. Ask him about his hole cost. We will gladly furnish a list of installations.

Machinery & Engineering Company
General Office
640 West Washington Blvd., Chicago 6
Representatives in Principal Cities

AFFILIATED WITH

CLEEREMAN MACHINE TOOL CO. Green Bay, Wisconsin

BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

"MARVEL" HAS always had the edge

MARVEL High-Speed-Edge Blades assure Faster more Accurate cutting with proven Economy and Complete Safety. Only the MARVEL is a composite blade with a high speed steel cutting edge electrically welded to an exceptionally tough, strong alloy steel body.

The High-Speed-Edge does the cutting while the alloy back, with hardened eyes, carries the load. Blade tensions up to 300% higher than those possible with ordinary blades are recommended. This greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MARVEL design feature) and cannot be overcome by work resistance. Heavier feeds and greater speeds are practical without "run out."

With greater accuracy, higher production and lower cost per cut, comes the extra dividend of Safety, for MARVEL High-Speed-Edge Hack Saw Blades are Positively Unbreakable—*they will not shatter.*

Ask your local MARVEL distributor (see classified phone book) to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary blades.

1.	High-Speed-Steel cutting edge.
2.	Tough unbreakable alloy steel body with hardened eyes.
1. & 2.	Integrally welded to make a fast-cutting, long lasting composite blade that is *positively unbreakable.*

ARMSTRONG-BLUM MFG. COMPANY

"THE HACK SAW PEOPLE"

5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**

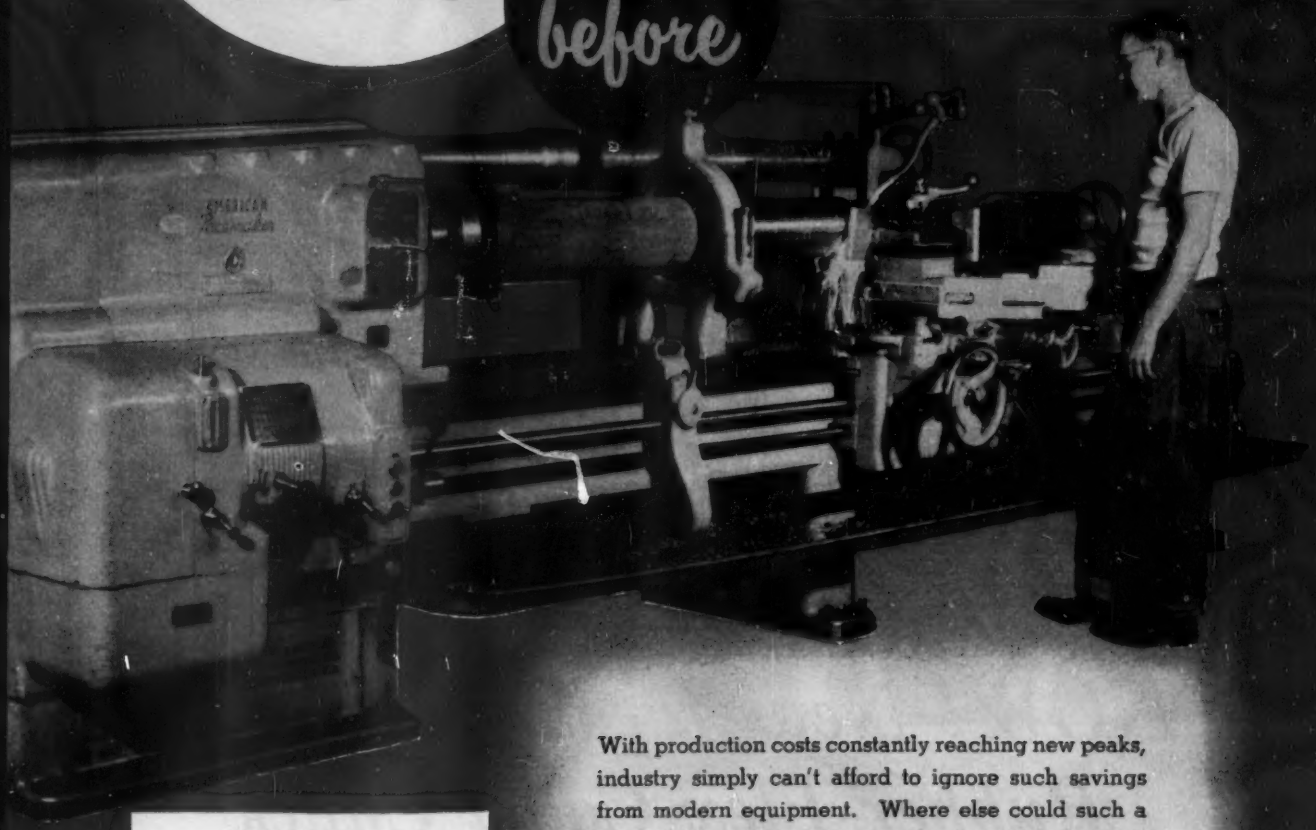
Metal Cutting MARVEL SAWS

Better Machines–Better Blades

2¼ hrs. now

9 hrs. before

Fairbanks, Morse & Co., Beloit, Wisconsin, is *really* putting the payroll dollar to work with its new 20 inch "AMERICAN" Heavy Duty All-Hydraulic Duplicating Lathe.



2000 horse power Fairbanks-Morse motor shafts are now being rough and finished turned in 2¼ hours floor to floor against a former time of 9 hours per shaft.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

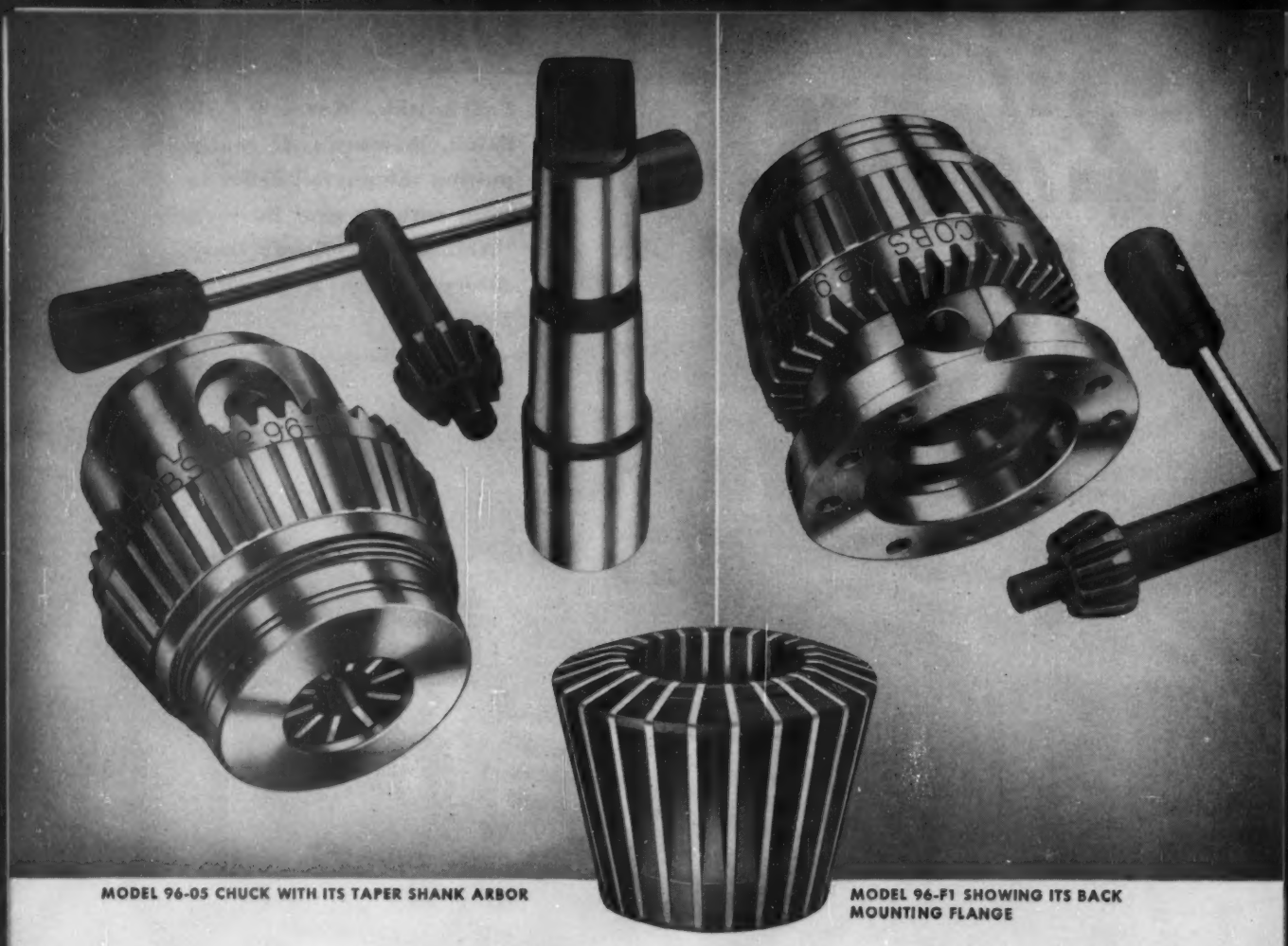
More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

Put your payroll dollar to work for greater profits with "AMERICAN".

Bulletin No. 35 shows many examples—it's yours for the asking.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



MODEL 96-05 CHUCK WITH ITS TAPER SHANK ARBOR

MODEL 96-F1 SHOWING ITS BACK MOUNTING FLANGE

NOW! New Jacobs Model 96 Rubber-Flex Collet Chuck

brings famous grip to whole new group of applications

Grinders! Milling machines! Jig borers! Jig grinders! Lathes! Various types of special machinery where precise compact collet closure is vital!

ALL get the benefit of the famous Jacobs Rubber-Flex Collet grip in the new Jacobs Model 96 Collet Chuck.

The long, steel jaws of this collet — locked together with oil-resistant synthetic rubber — provide an absolutely parallel grip over the entire bearing surface.

What's more, each collet has a full ⅛" range so that the standard set of eleven Rubber-Flex Collets cover the gripping range of eighty-eight split steel collets! A geared key tightening device and self-tightening toggle action of the collet jaws give the chuck gripping power far beyond that obtained with split steel collets. Chucks any diameter bar between 1/16" and 1⅜".

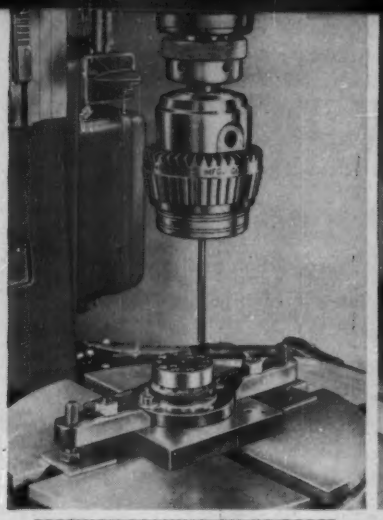
For work holding: Model 96 Collet Chuck permits precision chucking of bright finished bars, with close or wide tolerance diameters, resilient or compressible materials, tubing and brittle materials such as ceramics or glass.

For tool holding: Model 96 Collet Chuck can be used for drilling and reaming on jig borers and other high precision machines, holding proving bars and indicators. Extreme accuracy and wide capacity range make it ideal for tool and cutter grinding on cylindrical and cutter grinders.

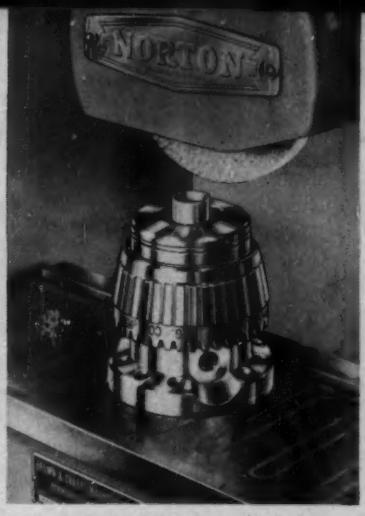
TWO MODELS: Model 96-05, $135.00; Model 96-F1, $150.00. Rubber-Flex Collets, $12.00 each.

For further details, ask your Industrial Supply Distributor for Catalog 54-CC. The Jacobs Manufacturing Company, West Hartford 10, Conn.

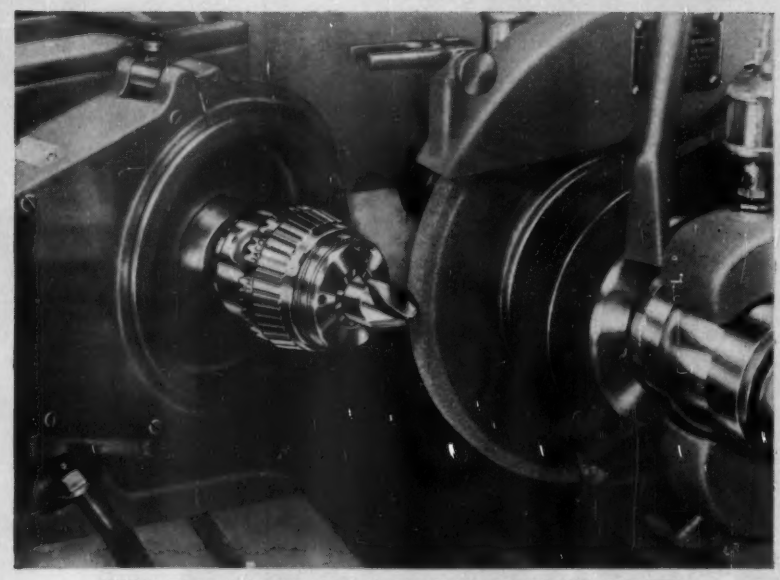
Jacobs
RUBBER-FLEX COLLETS



PRECISION REAMING ON JIG BORER with Model 96-05.



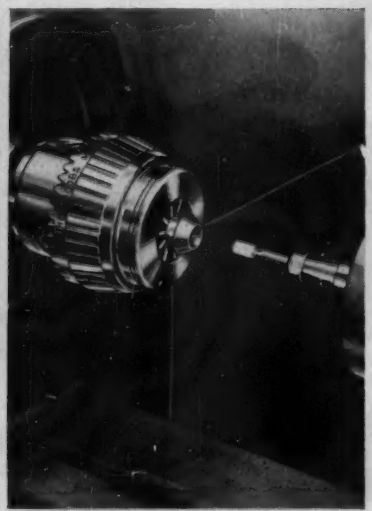
NEW JACOBS MODEL 96-F1 COLLET CHUCK on magnetic chuck holds work for surface grinder.



MODEL 96-05 ADAPTED TO HEADSTOCK OF CYLINDRICAL GRINDER.

CHUCKING WORK ON VERTICAL MILLING MACHINE with Model 96-F1.

NEW CHUCK Model 96-F1 here holds work on jig grinder.



PRECISION BUSHING GRINDING with Model 96-05.

IF IT'S A

JACOBS

IT HOLDS

Jacobs and your local distributor

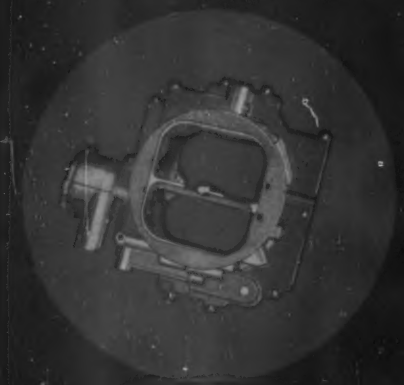
are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks

. . . first in service

DRILL-SPOT FACE-COUNTERSINK-REAM-TAP

20
individual operations



...on one Part
...on one Machine
...in ten Seconds!

...that's precision production on a **Morris**
MOR-SPEED Machine

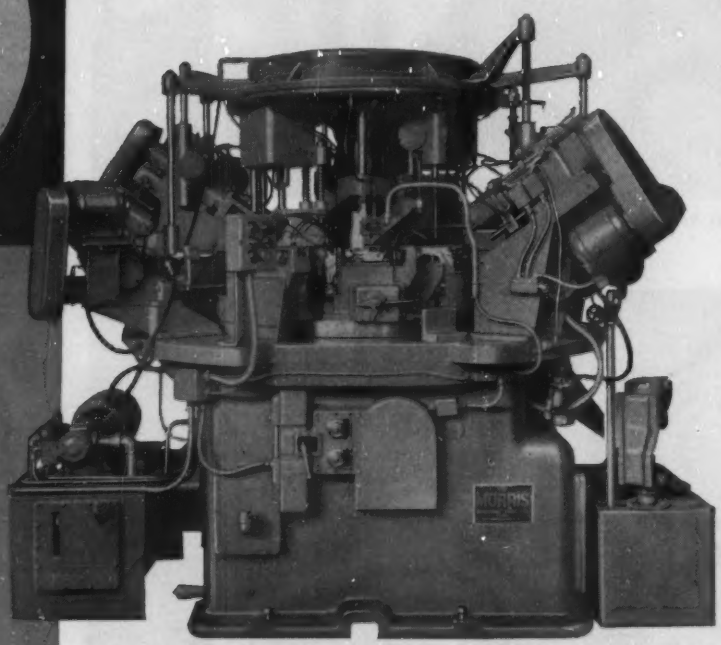
a better product at less cost with precision PLUS production

It's easy to say "the way to higher production and lower costs lies in special machinery." The sky-high price and limited application of a "special" often makes this solution impractical.

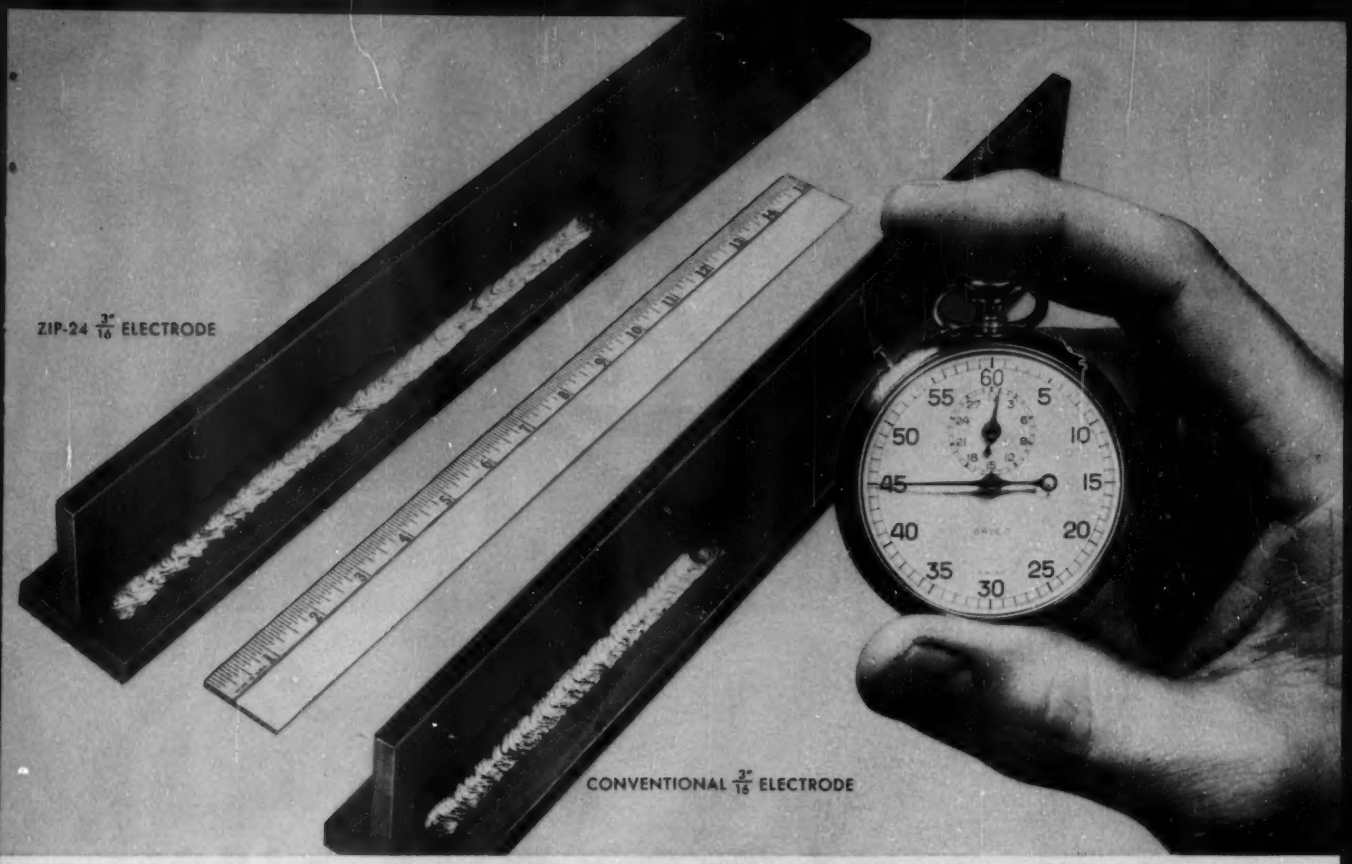
But Morris Engineers have developed a time-tested method for delivering precision production at lowest cost . . . *without* a staggering investment. Morris MOR-SPEED Machines combine *standard* machine units in a special design that offers all the advantages of "special machinery" without the big price tag.

The machine illustrated is a good example: standard base, standard indexing table, standard center column, standard straight and angular drilling heads, standard coolant and hydraulic units plus a minimum of special tooling. The result is "special" machine production at a very special, low cost.

Your drilling, tapping, reaming and similar operations may be adaptable to a MOR-SPEED solution. It costs you nothing to find out! *Write today for complete details.*



THE MORRIS MACHINE TOOL CO.
933 HARRIET ST., CINCINNATI 3, OHIO



New Westinghouse ZIP-24 Electrode welds twice as fast—better, easier, too

The greatest advancement in mild steel welding electrodes in years. That's what Westinghouse research, plus years of experience as an actual user of welding processes, has made the new ZIP-24. It now gives you a greater combination of plus features than any other powdered iron electrode. For example:

FASTER WELDS—*50 to 70%* greater deposit rates. And an increase of *30 to 50%* in footage of fillet or lap weld per minute.

BETTER WELDS—balanced fillets give appearance of "machined finish" . . . no undercut with fillet and lap welds . . . perfect wall wash-up . . . easier slag removal . . . minimum spatter loss that reduces cleaning time. And if that's not enough . . .

EASIER WELDS—even-edged, smooth, finely rippled weld beads even when handled by an inexperienced operator. It's ideal for "drag" technique . . . gives greater flexibility in weld types . . . can be used with either a-c or d-c. And it's available now for . . .

IMMEDIATE DELIVERY—made possible with the opening of our second electrode plant . . . a brand-new Westinghouse Electrode Plant at Montevallo, Alabama. Over 57,000 square feet of additional manufacturing space to give you immediate delivery on the new ZIP-24 and the complete line of quality electrodes . . . *manufactured by Westinghouse.* J-21859

LEARN MORE ABOUT THE NEW ZIP-24 ELECTRODE!

YOU CAN BE SURE...IF IT'S
Westinghouse

WESTINGHOUSE ELECTRIC CORPORATION
Welding Department, P. O. Box 868, Pittsburgh, Pa.

Please send me a copy of your new folder on the ZIP-24 electrode (B-6389).

☐ I would like free samples of the new ZIP-24 electrode.

☐ Send me literature on the complete line of Westinghouse Electrodes (B-6070).

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

ATRAX IN ACTION

$3,000 SAVINGS IN LABOR WITH $100 WORTH OF CARBIDE BURS

A CASE HISTORY: One of our customers had an extremely difficult problem of burring some piece parts after assembly. After consultation with Atrax engineers, it was determined that Solid Carbide Burs were the only type that could be used to salvage this huge job. Six Carbide Burs were bought for this job, totalling approximately $100.00. They saved the company over $3,000.00 in labor. Besides this, they made possible salvage of very valuable piece parts for a very nominal original investment.

Possibly our engineers or sales representatives can help YOU achieve similar savings. You'll find them in all principal cities, ready to consult without any obligation.

NEW! Complete 88-page Manual and Catalog of Carbide Tools. Write for your free copy.

THE ATRAX COMPANY

NEWINGTON 11, CONNECTICUT

smooth, direct parts flow

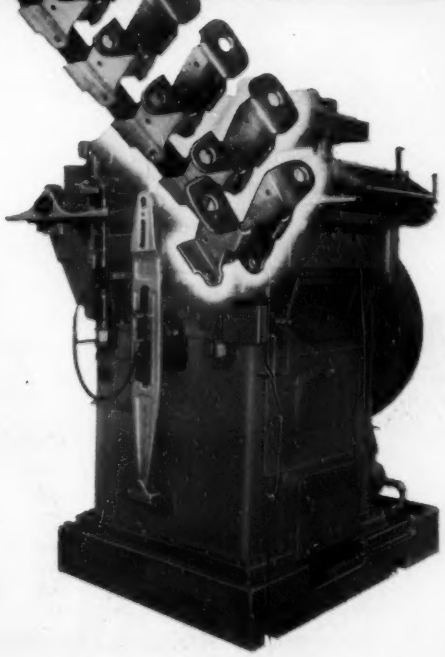
for short or long runs.

Because of its superior ability to take off center die loads, the Henry & Wright Dieing Machine widens the ways in which you can use the economies of progressive stamping. Add to this basic advantage the accessibility of the H & W Dieing Machine for quick die changes.

Now tie the two together and you have a high speed, low cost production method that affords the maximum degree of flexibility in tooling. Jobs can be completed according to the toughest schedules. Short runs can be mixed with long runs. Assembly tooling can be readily incorporated. Your planning becomes a direct and simple matter of figuring so many completed parts per minute or hour per machine.

Most important, too: you cut your stamping costs below your best expectations and you improve parts quality.

Get the facts about H & W Dieing Machines by writing to Henry & Wright, 481 Windsor Street, Hartford, Conn., for Catalog 54.



HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

HARTFORD, CONNECTICUT

Combine in Palouse Wheat Fields

FPG Photo

BULLARD

The Invisible Background of Industrial Progress

Not too many years ago farming was an occupation of long hours, physical brawn and animal power. Today, however, thanks to mechanical tools and implements, the job of those engaged in agriculture is more productive with less effort and time. This enables the farmers, by and large, to enjoy today's high standard of living and modern conveniences.

Manufacturers of trucks, cultivators, tractors, sprayers, thrashers, spreaders and reapers, just to mention a few, recognize that modern methods and procedures using *Modern Machine Tools* enable them to provide the farmer with these labor-saving, time-saving implements at lowest cost — another example of "The Invisible Background of Industrial Progress."

THE BULLARD COMPANY - BRIDGEPORT 2, CONNECTICUT

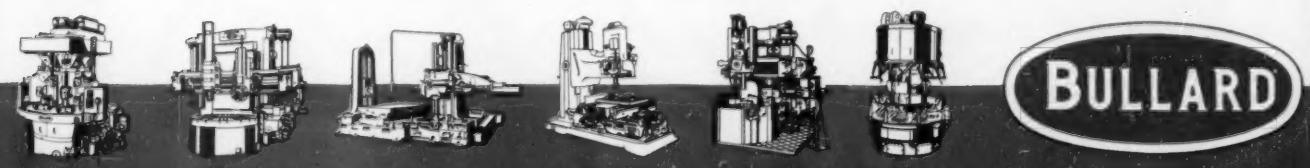
Bullard Mult-Au-Matic
Type "D"–8"–12"–16" with 6 or 8 Spindles, Type "D" 16–23 and Type "K" 6 Spindles and 6 twin Spindles, 8 Spindles and 8 twin Spindles.

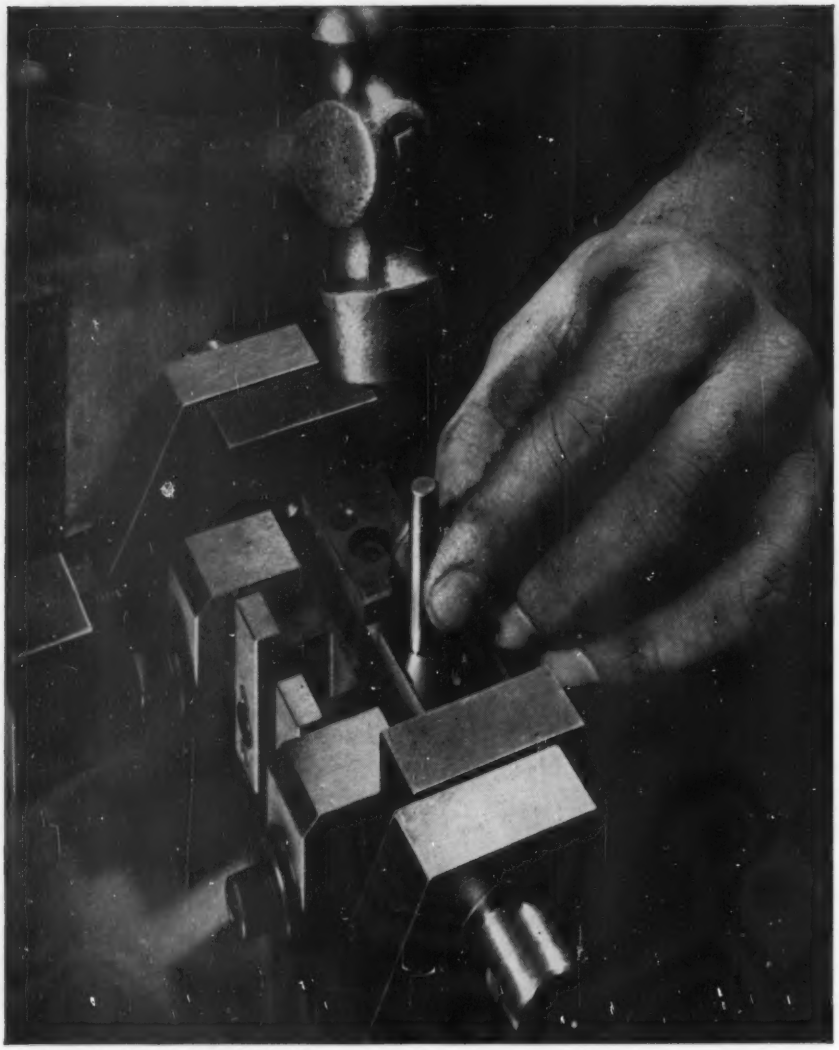
Are you interested in reliability and flexibility of the machine tools in your plant? Then examine your needs in the light of the experience of a nationally known manufacturer and user of Mult-Au-Matics. Here is what they report on Bullard Mult-Au-Matics:

Reliability — Machines operating 24 hours a day, 5 days a week. Four other departments depend on parts machined on Bullard Mult-Au-Matics to maintain their production schedules.

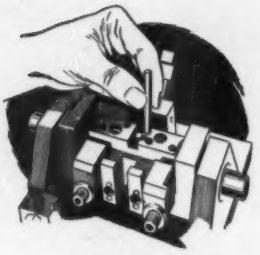
Flexibility — Machine a wide range of parts including gears, carriers and nozzles of a great variety of materials up to 365 Brinnell hardness. Do in one fast machining cycle what may require two or three longer operations on a horizontal turret lathe.

These productive, time-saving, cost-reducing features can be applied to your machining problems. A Bullard Sales Engineer will cheerfully review them with you — call him or write to The Bullard Company, Bridgeport 2, Connecticut — phone EDison 6-2511.

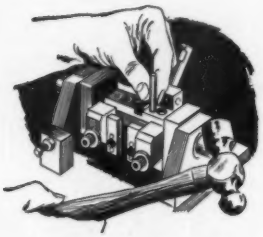




UNBRAKO Precision-Ground Dowel Pins are widely used for aligning parts, as in dies, jigs and fixtures. This radius grinding fixture, for putting a flat on electronic shafting, is a good example of such an application.



Assembler inserts formed end of UNBRAKO dowel pin into hole preparatory to tapping it into position.



Formed ends, with continuous grain flow, won't chip. Uniform heat treatment permits UNBRAKO dowel pins to be driven in and out of holes without upsetting.

UNBRAKO dowel pins—made of heat treated alloy steel—have a surface hardness of 60-62 Rockwell "C" Scale; a surface finish of 6 microinch maximum; a core hardness of 50-54 Rockwell "C" Scale; an average single shear strength of 150,000 psi; and a diameter tolerance of ±0.0001". They are available in two standard sizes in diameters from ⅛" to 1".

Keep your inventory at a minimum
Use UNBRAKO Standards—stocked by your distributor

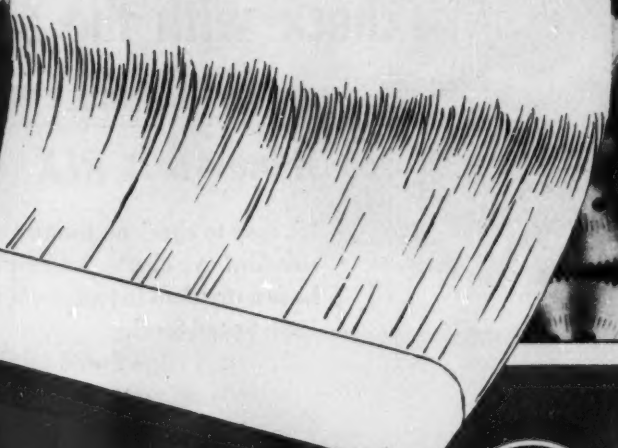
Because your UNBRAKO distributor stocks a full line of standard UNBRAKO socket screw products, your inventory is lowered. This ready supply not only cuts your investment, but gives you faster delivery and reduces your buying costs. For a complete listing of standard UNBRAKO products, see your distributor or write STANDARD PRESSED STEEL CO., Jenkintown 1, Penna.

UNBRAKO SOCKET SCREW DIVISION

SPS JENKINTOWN PENNSYLVANIA

Make A Clean Sweep of your Small Gear Problems

G.S. Gears can *clean up* troublesome Gearing problems. Here's why: each unit, however simple or intricate, in runs of hundreds or thousands, measures up to the *most extreme standards of accuracy!* It's this *uniform* excellence that counts . . a precise quality developed and perfected here through 38 years of specializing in making better Small Gears exclusively. This vast experience has brought peace of mind and speedier, less costly assembly operations to a host of critical manufacturers from coast-to-coast. Join this growing group of well pleased G. S. customers next time you need Small Gears. Tell us about your needs. Our capable engineers will be quick to lend you every possible aid.



GET OUR *Free* 6-PAGE FOLDER

See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. This attractively printed 8½ x 11" 6-page folder is punched for ring-binder use. You'll want to keep it handy for frequent reference. It contains 22 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!

FRACTIONAL HORSEPOWER GS

GEAR Specialties, Inc.

2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

check with the standard

... and with high speed steels

the standard is REX

It's easy to check on Junior's vision these days with *standard* eye charts. And for half a century there's been a *standard* in tool steels, too — Crucible REX® High Speed Steel.

Try REX High Speed Steel in your own shop as thousands all over the world have done. Use it under the toughest conditions . . . compare its performance with all other high speed steels. You'll find that *absolutely nothing beats REX.*

That's because REX High Speed Steels are unsurpassed in structure, finish, carbide distribution, response to heat treatment and general uniformity. So, on your next purchase of high speed steel, specify REX — made only by Crucible.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

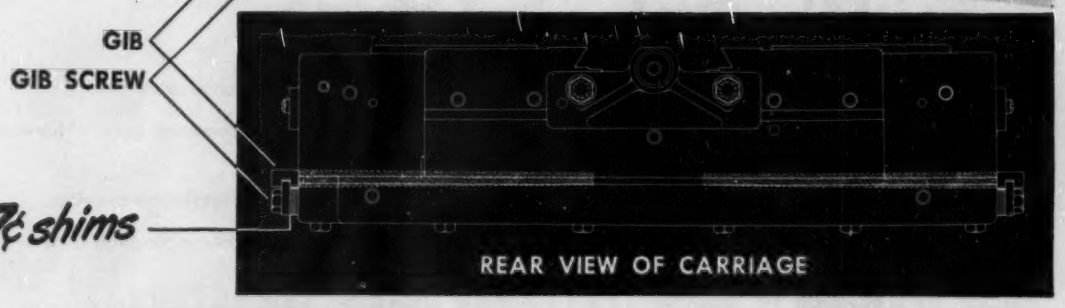
TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

RENEW LATHE CARRIAGE ACCURACY ...just discard 7¢ shims!

In Lodge & Shipley's exclusive design, all wear takes place uniformly under the carriage . . . where it is easily compensated by gibs designed for quick, accurate adjustment.



That's right! Remove a shim at each of four gibs and you've made an accurate .001" tightening adjustment, since the taper of the gib is .016" per inch and the shims are 1/16" thick. It's that simple.

The Lodge & Shipley carriage and gibs design is but a single example of many Model-X lathe features that save time and maintain accuracy. Carriage V-bearing surfaces are hand scraped to the special hardened steel replaceable bedways. Wear, when it occurs, must occur uniformly under the carriage where it's easily adjusted with the gibs.

Lodge & Shipley Lathes combine long-lasting accuracy and low-cost operation with versatility and productivity . . . and prove their worth in a series of case histories available on request.

THE **Lodge & Shipley** COMPANY

3055 COLERAIN AVE., CINCINNATI 25, OHIO

....your **LODGE**-*ical choice!*

This is a Quality Drill Head

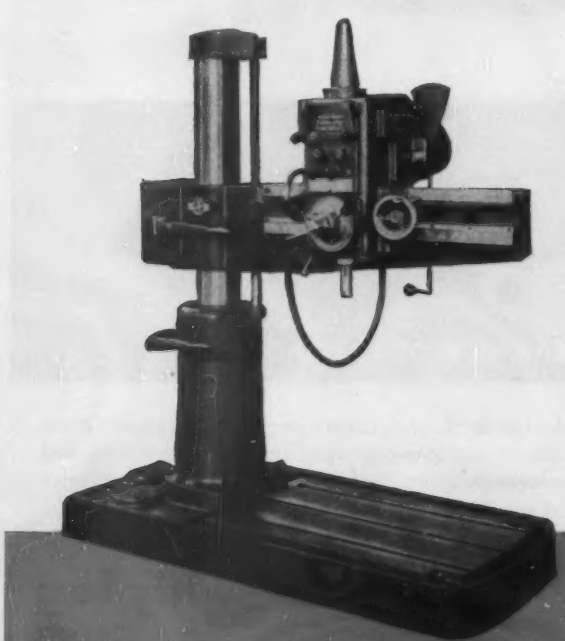
It provides 9 spindle speeds in geometric progression from 80 to 2420 rpm. It has six rates of power feed—.0025″ to .020″. All controls are conveniently located. The alloy steel spindle is counterbalanced by an adjustable spring. The entire mechanism is force-spray lubricated.

It is Standard on Cincinnati 3′7″ Radials costing only $3565*

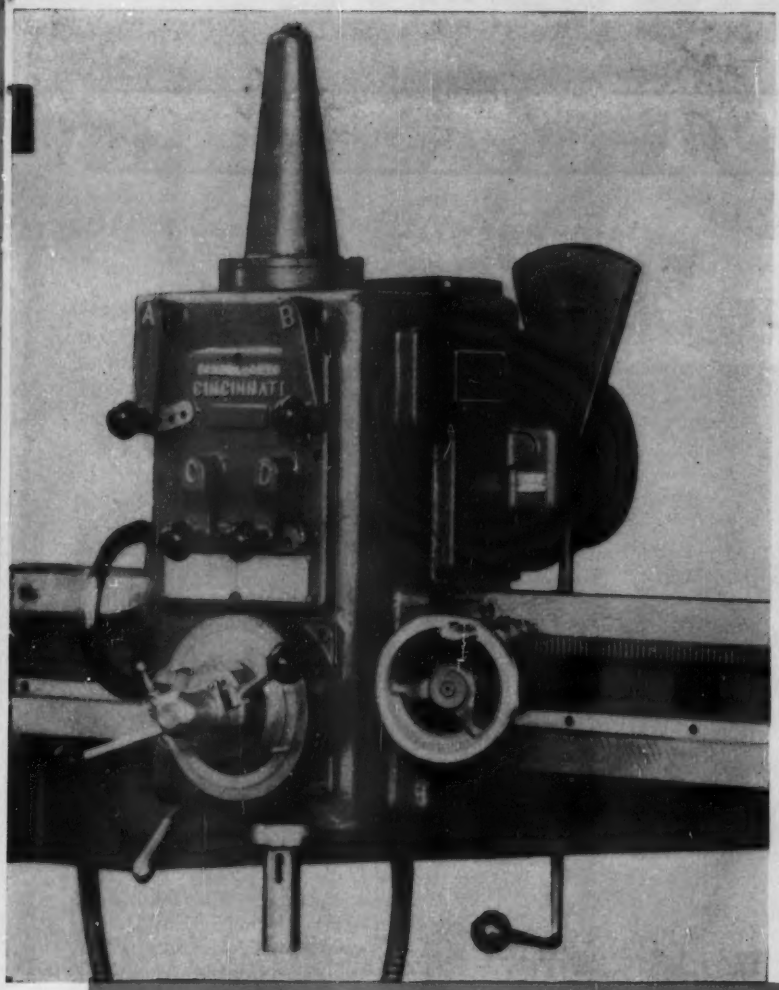
For any shop with drilling jobs of 1″ and under, the Cincinnati Radial offers important moneysaving advantages. Low in first cost—low in maintenance—Cincinnati Radials can do the bulk of your drilling jobs. They free expensive equipment for the heavy, special jobs.

For name of local dealer, complete catalog information and prices, write on company letterhead to: Cincinnati Lathe & Tool Co., 3249 Disney, Cincinnati 9, Ohio.

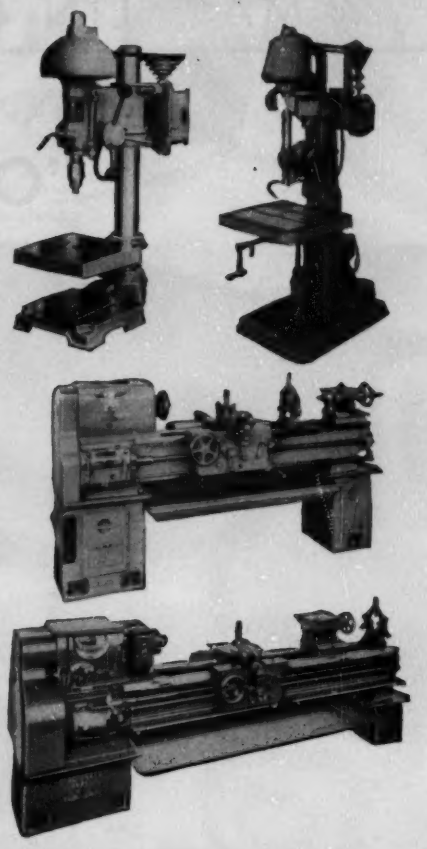
*FOB factory. Prices subject to change without notice. Price includes 220, 440 or 550-volt, 50 or 60-cycle, 2 or 3-phase, 1800-rpm, 1-hp, a-c main drive motor; ½-hp, a-c arm motor and controls. No. 3 MT spindle.



1. Unit construction throughout.
2. Simple, direct drive.
3. All-geared head.
4. Self-contained feed transmission.
5. All speed and feed transmission gears of hardened alloy steel.
6. All shafts mounted on antifriction bearings.
7. Ground tubular steel column mounted on anti-friction bearings.
8. Multiple-disc clutches for spindle drive.
9. Hardened and ground head rail.



There is also a complete line of Cincinnati Lathes—Floor and Bench Drilling Machines



center on . . .

cincinnati lathes and drills

For a clear comparison of Cincinnati Lathes with other equipment, write for a free copy of "Management Facts About Lathes".

At MACKLIN COMPANY JACKSON, MICHIGAN

"Our ELMES Press has DOUBLED PRODUCTION on Large Grinding Wheels"

Above: Stripping the mold from a 42″ x 2″ x 12″ Macklin Grinding Wheel that has just been pressed on the Elmes 2000-Ton Forming Press. Photo at right shows the same wheel before pressing. The abrasive material has been leveled in the mold and is ready for the pressure forming operation.

The Macklin Company manufactures abrasive wheels in a complete range of shapes and sizes for all types of grinding work. One of their newest production aids for processing large wheels up to 48″ in diameter is the ELMES® 2000-Ton Abrasive Wheel Forming Press shown at left. The press is lever controlled with two pressures available. Its smooth performance and rugged construction has enabled the Macklin Company to *double their output* of large size wheels.

This actual "case history" in one particular field is typical of the outstanding performance of Elmes Hydraulic Presses of *every* type, such as metal drawing and forming, forcing, bending, straightening, forging, hobbing, etc. Whatever your operation, you *profit* when you "put your pressing problems up to Elmes".

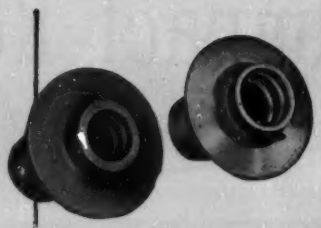
Let Elmes assist you in selection or design of the right press for your production. Recommendations and cost estimates are yours for the asking.

AMERICAN STEEL FOUNDRIES

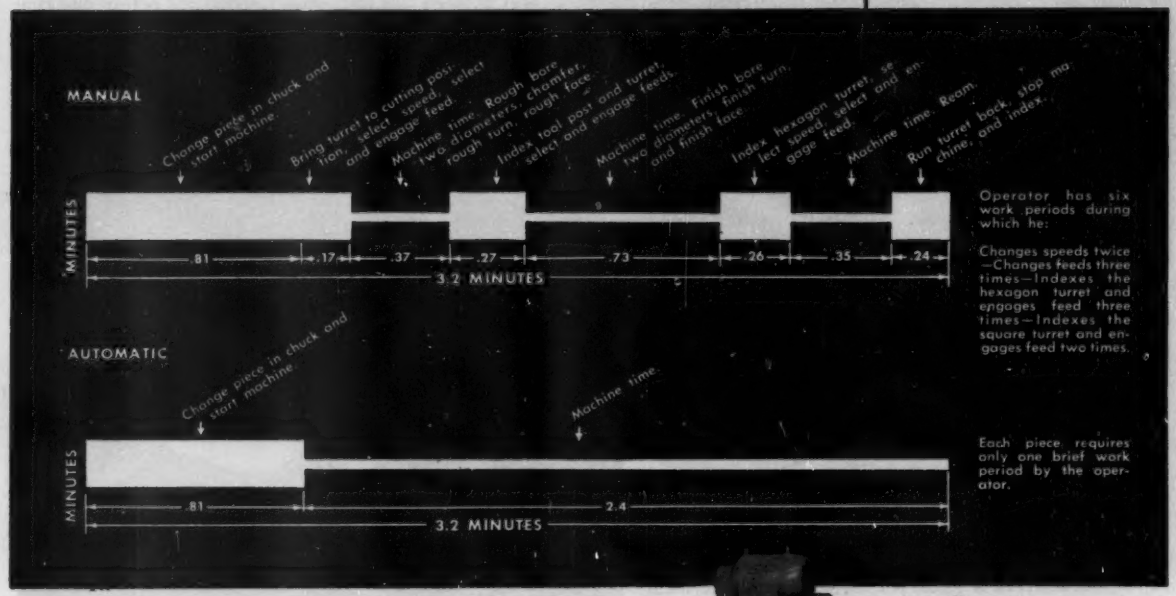
ELMES ENGINEERING DIVISION

hydraulic presses and equipment .... 1161 TENNESSEE AVE., CINCINNATI 29, OHIO

how the
GISHOLT FASTERMATIC
saves man-minutes and money!



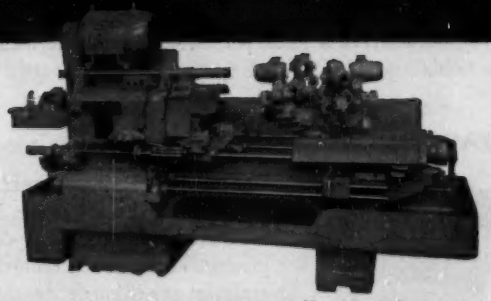
Here is an actual comparison of the time and work cycle of a manually operated turret lathe and a Gisholt Fastermatic Automatic Turret Lathe. The machining of wheel hubs, shown above, requires 6 operations as follows: rough bore, finish bore, ream, rough face, finish face and chamfer. Note that the manually operated machine takes over 54% of the operator's time whereas the Fastermatic takes only 25% of his time, leaving 75% without interruption.


MANUAL
Change piece in chuck and start machine.
Bring turret to cutting position, select speed, select and engage feed.
Machine time. Rough bore two diameters, chamfer, rough turn, rough face.
Index tool post and turret, select and engage feeds.
Machine time. Finish bore two diameters, finish turn and finish face.
Index hexagon turret, select speed, select and engage feed.
Machine time. Ream.
Run turret back, stop machine, and index.
MINUTES
.81
.17
.37
.27
.73
.26
.35
.24
3.2 MINUTES
Operator has six work periods during which he:
Changes speeds twice —Changes feeds three times—Indexes the hexagon turret and engages feed three times—Indexes the square turret and engages feed two times.
AUTOMATIC
Change piece in chuck and start machine.
Machine time.
MINUTES
.81
2.4
3.2 MINUTES
Each piece requires only one brief work period by the operator.

That's the story of the Fastermatic in a nutshell—less work time for the operator. The Fastermatic handles all changes of feeds and speeds automatically.

In this case, for example, the other side of the work piece is done by another Fastermatic with substantially the same cycle. One operator keeps both machines constantly under cut and still has ample time for stacking and work inspection. Important, too, is the fact that both Fastermatics are tended by a comparatively unskilled operator.

There are many such cases where Fastermatics can cut costs substantially. Gisholt engineers will gladly answer your questions. Write us.

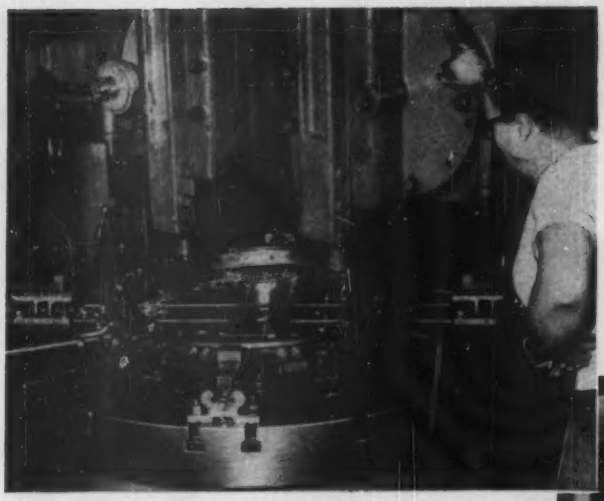


THE GISHOLT 1-F FASTERMATIC—*smallest of 3 different sizes which enable you to machine a maximum number of surfaces in one chucking, handling all changes in speed and feed automatically. On this job, turret was double-tooled so that two parts were completed with each revolution of the turret. Ask for literature.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

Impact Resistance Helped These Jobs PAY OFF



6 TIMES MORE RINGS PER GRIND

HAYNES STELLITE 98M2 alloy tools machine six of these stainless steel rings per grind. They remove 55 cubic inches of metal in 15 minutes while making interrupted cuts across two weld seams, 12 bolted sectors, and 36 bolt holes. Tools previously used failed before one ring was finished. The metal being machined is 321 stainless steel. The depth of cut is ¼ inch, and the speed is 160 revolutions per minute.

40 PER CENT MORE CASTINGS PER GRIND

20 cubic inches of metal per minute are removed from this 18-8 stainless steel casting by HAYNES STELLITE 98M2 alloy tools. The tools make 18 interrupted cuts per revolution as they machine the entire face of this 54 inch casting. Despite the severe operating conditions, HAYNES STELLITE tools turned out 40 per cent more castings per grind than any other tools tested. Cutting speed is 100 surface feet per minute, the depth of cut averaged ¼ in., and the feed is 1/16 in. per revolution. No lubricant was used.

IMPACT RESISTANCE PLUS RED HARDNESS

The ability of HAYNES STELLITE tools to resist impact from intermittent and irregular cuts, chatter, and shock loading, is the main reason they were successful on these jobs. The tools are hard, too, and retain their hardness at red heat. This combination of properties guarantees fast metal removal; makes deep cuts at heavy feeds possible even under the toughest conditions.

A manual on cutting tool practice has been prepared to help you use HAYNES STELLITE tools to advantage. Write to any of our District Offices listed below for your free copy.

HAYNES STELLITE

Trade-Mark

Metal Cutting Tools

The original cobalt-chromium-tungsten metal-cutting tool.

"Haynes Stellite" is a registered trade-mark of Union Carbide and Carbon Corporation.

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

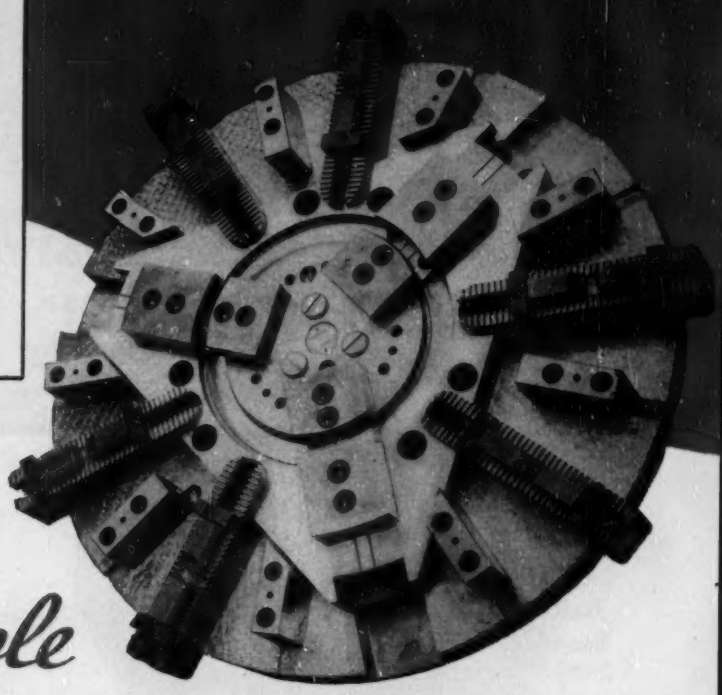
CUSHMAN

gives you CHUCK-ABILITY

CHUCK-ABILITY:

The ability to SPEED your work...ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right work-holding devices.

Remember—
You can't machine it economically unless you hold it right



an example

. . . of this is the series of special chucks engineered and designed to hold jet engine discs and rings while being machined to exceedingly close tolerances. These jet engine parts, vital to our country's air arm, presented a major work-holding problem because of their large size and extremely small cross section. Until Cushman developed these special chucks, most forms of work-holding devices caused severe distortion difficulties. Design and engineering service such as this is always available to industry through the Cushman Engineering Department. Find out what Chuck-Ability can do for you . . . write Cushman for Special Data Book No. 852 describing Cushman Wheel and Ring Chucks.

THE CUSHMAN CHUCK COMPANY

806 Windsor Street **Hartford 2, Connecticut, U.S.A.**

CUSHMAN the CHUCKMAN CHUCKS AND ACCESSORIES Exclusively SINCE 1867

Manufacturers of

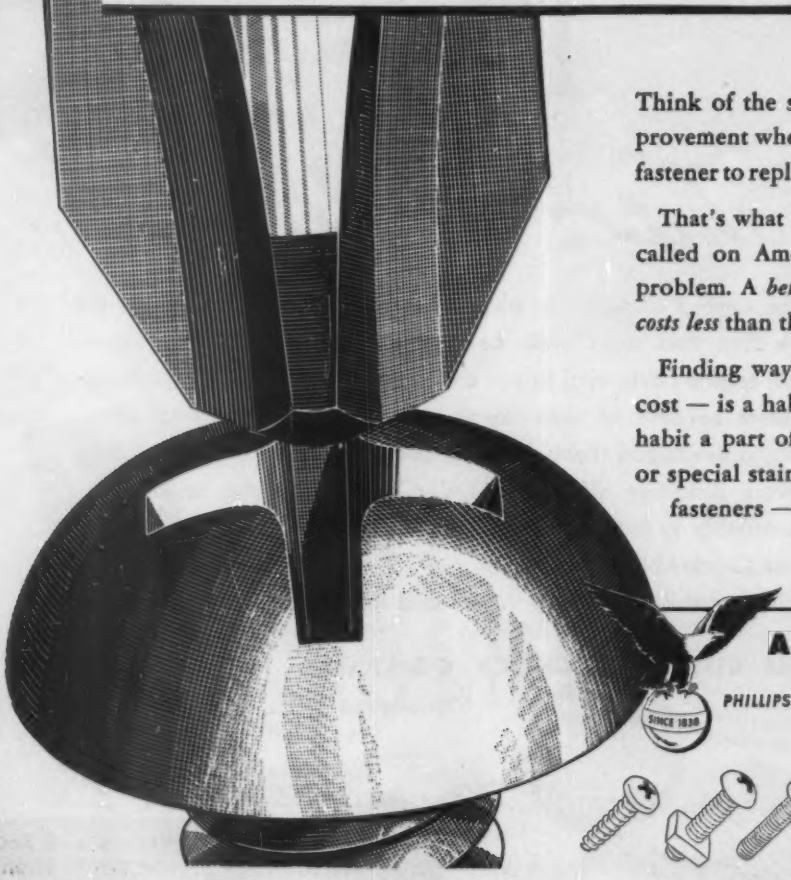
Air Operated Chucks, Cylinders and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.

A WORLD STANDARD FOR PRECISION

ASK YOUR INDUSTRIAL DISTRIBUTOR

Now a one-piece, cold-headed non-corrosive fastener, this was once made from a machine screw, the head covered with brass and the brass crimped in place.

"A 3-part job became 1... when we called AMERICAN for NON-CORROSIVE FASTENERS!"



Think of the savings. Think of the product improvement when you get a one-piece cold-headed fastener to replace a unit made in three operations.

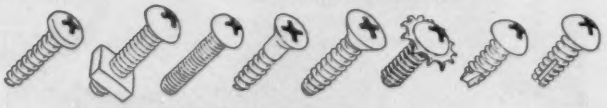
That's what happened here when the customer called on American for help with a fastening problem. A *better* fastener was developed, and it *costs less* than the one previously used.

Finding ways to fasten it better — and at less cost — is a habit here at American. To make our habit a part of your profit on standard Phillips or special stainless steel and other non-corrosive fasteners — get in touch with:

AMERICAN SCREW COMPANY

PHILLIPS HEADquarters — WILLIMANTIC, CONNECTICUT

Main Office & Plant — Willimantic, Conn.
Office & Plant, Norristown, Pa.
Office & Warehouse, Chicago, Ill.

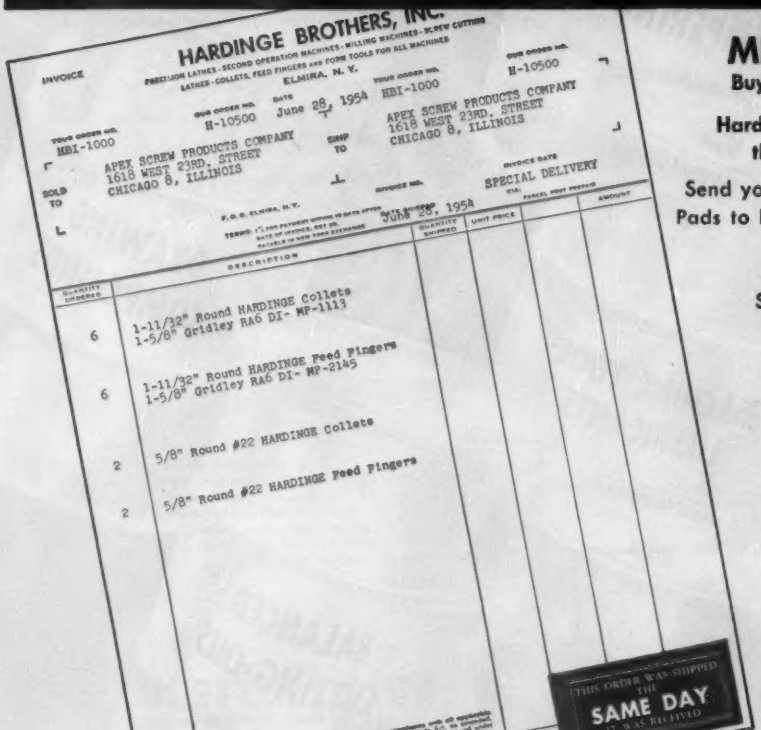


HARDINGE
ELMIRA, N.Y.

Collets Feed Fingers Pads

Shipped the Same Day

THIS ORDER WAS SHIPPED THE **SAME DAY** IT WAS RECEIVED


HARDINGE BROTHERS, INC.
PRECISION LATHES - SECOND OPERATION MACHINES - MILLING MACHINES - SCREW CUTTING LATHES - COLLETS, FEED FINGERS AND FORM TOOLS FOR ALL MACHINES
ELMIRA, N. Y.
INVOICE
YOUR ORDER NO. MBI-1000
OUR ORDER NO. H-10500
DATE June 28, 1954
YOUR ORDER NO. MBI-1000
OUR ORDER NO. H-10500
SOLD TO APEX SCREW PRODUCTS COMPANY 1618 WEST 23RD. STREET CHICAGO 8, ILLINOIS
SHIP TO APEX SCREW PRODUCTS COMPANY 1618 WEST 23RD. STREET CHICAGO 8, ILLINOIS
F.O.B. ELMIRA, N.Y.
INVOICE NO.
INVOICE DATE SPECIAL DELIVERY
DATE SHIPPED June 28, 1954
QUANTITY ORDERED
DESCRIPTION
QUANTITY SHIPPED
UNIT PRICE
AMOUNT
6 1-11/32" Round HARDINGE Collets 1-5/8" Gridley RA6 DI- MP-1113
6 1-11/32" Round HARDINGE Feed Fingers 1-5/8" Gridley RA6 DI- MP-2145
2 5/8" Round #22 HARDINGE Collets
2 5/8" Round #22 HARDINGE Feed Fingers
THIS ORDER WAS SHIPPED THE SAME DAY IT WAS RECEIVED

MEMO TO:
Buyers of Collets, Feed Fingers and Pads

Hardinge delivers from stock, quality items that give top performance at low cost.

Send your orders for Collets, Feed Fingers and Pads to Hardinge. Watch for packing lists and invoice with the slogan imprinted

"This order was Shipped the SAME DAY it was Received."

These imprinted forms are symbols of the services from Hardinge that await your orders.

Large stocks are maintained in the following distribution centers: Hartford, New York, Philadelphia, Baltimore, Elmira, Detroit, Dayton, Chicago, St. Louis, Minneapolis, Los Angeles, San Francisco.

Immediate Stock Delivery

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

More than a "Coolant"

KLEENKUT • SOLVOL • SPEEDKUT • EXCELENE • THREDKUT •

is needed ....

3 STEPS TO SUPERIOR PERFORMANCE

To help you select the right industrial lubricant to do the best job. Consider all three carefully.

As the cutting tool meets the workpiece and chips start peeling off...lubrication and temperature control become of prime importance. More than a "coolant" is needed now to produce the optimum in production, finish and tool life. The cutting fluid must have superior lubricity, temperature control and chemical activity to properly eliminate scuffing of the tool and workpiece, reduce frictional wear and provide high anti-weld characteristics to prevent metallic seizure.

The D. A. Stuart Oil Company's modern laboratory is constantly at work developing industrial lubricants that are *just right for your job!* These include straight oil type cutting and grinding fluids, water-mix cutting and grinding fluids, drawing and stamping compounds, and lubricating oils and greases for gears, bearings and machine tool ways. For the best guide to the *right* industrial lubricant that will save you time, money and material, contact "the Man in the Barrel", your Stuart Representative. He knows how to solve your industrial lubrication problems. Fill in the coupon below today...ask to have him call.

1. LUBRICITY

The characteristic of an industrial lubricant that reduces scuffing of the work and tool. Proper lubricity can eliminate rough finish, stop tearing of threads and sharp edges and promote proper chip formation.

2. TEMPERATURE CONTROL

Temperature regulation helps provide maximum efficiency—ignored, it can ruin efficiency. Excessive heat can change the character of a metal—temperature fluctuation will cause irregular chip formation or may even make it impossible.

3. CHEMICAL ACTION

Additives are introduced to industrial lubricants to produce super lubricity and anti-weld characteristics that prevent scuffing and seizure. However, chemical activity must be *carefully balanced* and *controlled* to meet job conditions and provide best results. Too much additive causes excessive wear . . . too little results in scuffing, seizure and rough finish.

Represents the pooling of experience and technical information from Stuart's Laboratory, field men and product users regarding the selection of the *right* cutting fluid to do the best job!

"The Man in the Barrel" knows how to obtain superior performance with industrial lubricants. When you're in doubt . . . contact Stuart Oil Company.

D. A. Stuart Oil Co. LIMITED
EST 1865

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2729 S. Troy St., Chicago 23, Illinois
In Canada: Canadian D. A. Stuart Oil Co., Ltd.
3575 Danforth Ave., Toronto

CLIP TO YOUR COMPANY LETTERHEAD AND MAIL TO

D. A. Stuart Oil Company
2729 S. Troy Street, Chicago 23, Illinois

☐ Please have Stuart Representative call.

☐ Please send copy of booklet titled Stuart's Cutting Oil Bases.

Name .....

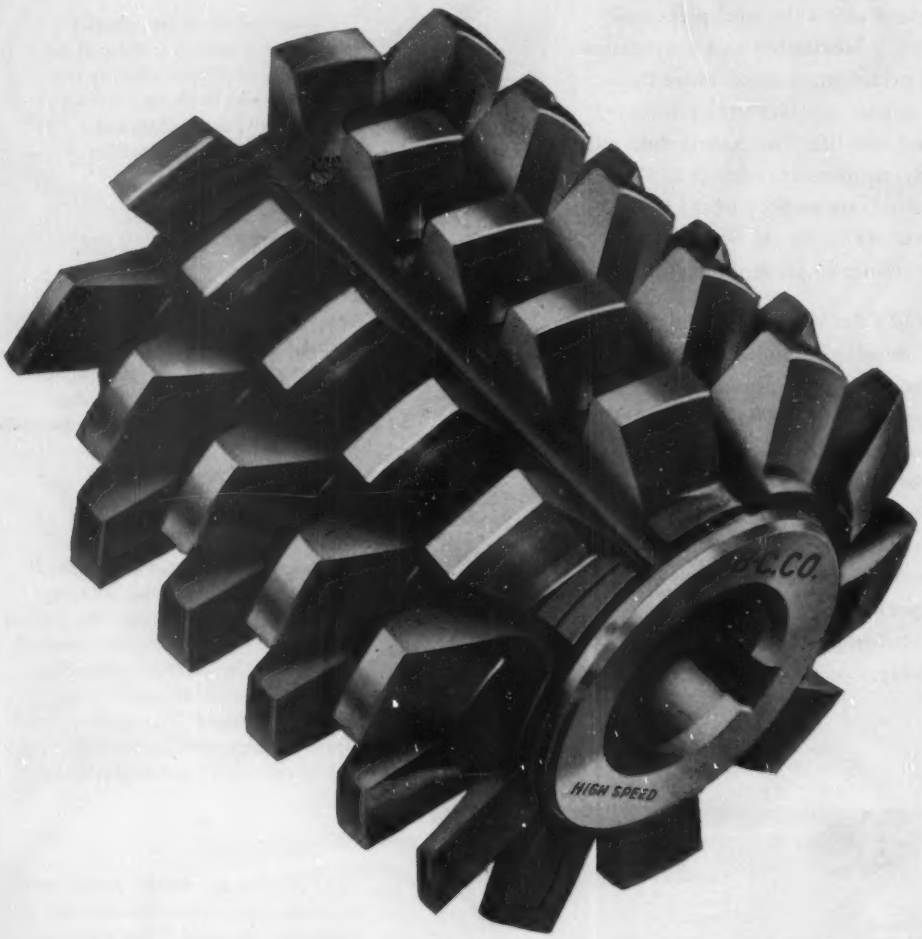
Title .....

THREDKUT 99 • SUPERKOOL • CODOL • DASCO • STURACO E. P. LUBES

Barber-Colman

HOBS

designed for gear tooth accuracy, long cutting life, new feeds and speeds



An expertly designed hob gives finer quality gears, more gears per hob life, and lower cost per cut gear.

New heat treating techniques and production equipment used in the manufacture of Barber-Colman Hobs result in superior gear cutting performance.

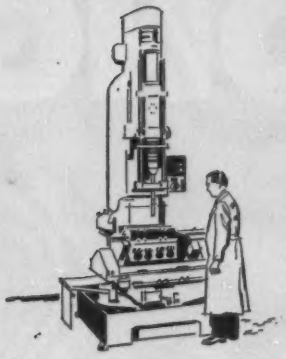
Call your Barber-Colman representative for help on cutting spur or helical gear teeth, splines, serrations or special forms.

BARBER COLMAN

Barber-Colman Company *hob pioneers in*

GENERAL OFFICES AND PLANT: 718 ROCK STREET, ROCKFORD, ILLINOIS

ultra-fine pitches
multithread hobs
accurate unground hobs
precision class aa hobs



"Threads tore when they tapped B-1117 steel pipe ...here's why"

During a recent visit to a large midwestern manufacturer of refrigeration and heat transfer equipment, Sinclair Industrial Representative R. L. Hart found the concern experiencing unusual difficulty in tapping a B-1117 steel pipe.

Oil not following tap

Mr. Hart reports, "The work was being done on a hand screw machine with competitive cutting fluid. Closer inspection showed that the oil *was not following the tap but was wiping off at the point of insertion*—leaving a rough, torn thread."

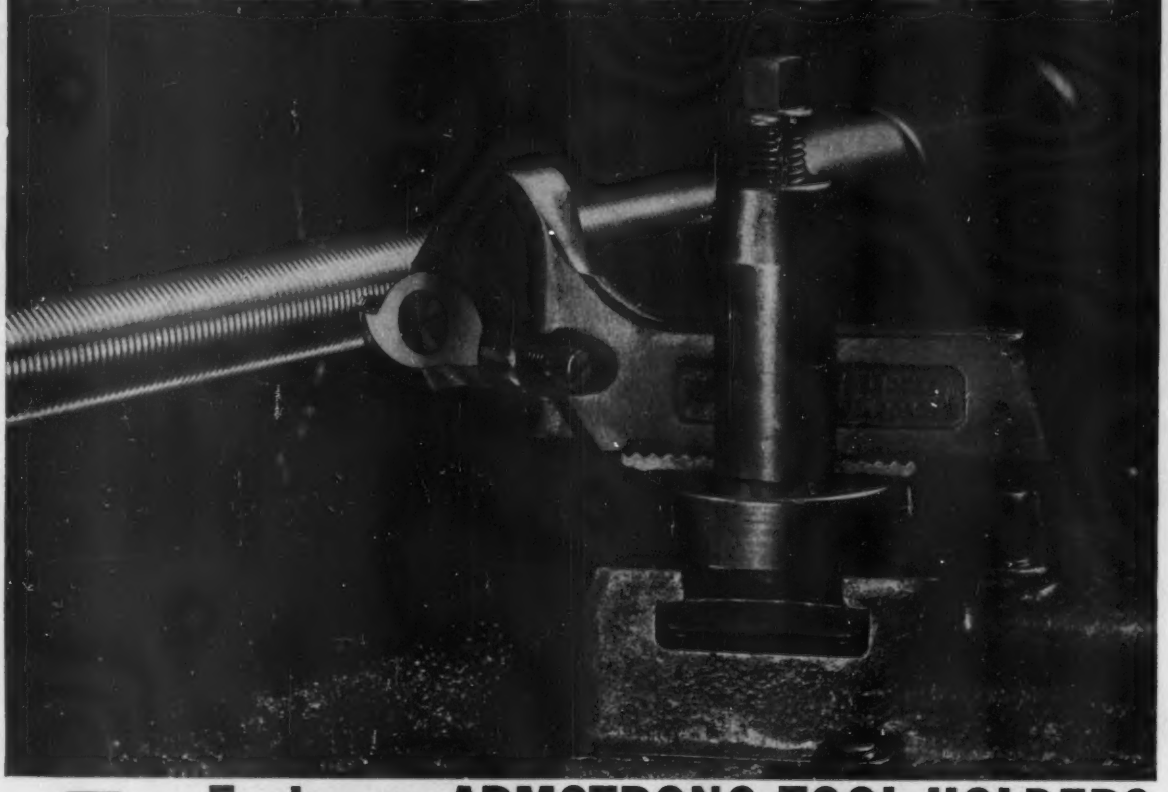
Needed lightness, lard and sulphur

Mr. Hart continues, "Basing my recommendation on previous experience, I suggested Sinclair AUTOKUT® C. This oil would be light enough to follow the tap—with enough lard and sulphur to perform the cutting job. The manufacturer agreed to switch. In two weeks time he reported *the trouble had completely vanished*—thread quality far exceeded his expectations."

Why not let a Sinclair Lubrication Engineer help solve *your* cutting oil problems. *There's no obligation.* Contact your local Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR LUBRICANTS

ARMSTRONG



The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

Write for catalog

Each year ARMSTRONG TOOL HOLDERS become more important to you

Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Save: All Forging, 70% Grinding, 90% High Speed Steel."

ARMSTRONG TOOL HOLDERS reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

ARMSTRONG TOOL HOLDERS permit increased speeds and feeds—produce more pieces per hour per machine tool.

ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are quantity produced by modern methods, for a world market . . . are used by over 96% of the machine shops and tool rooms . . . are carried in stock for your convenience by all industrial distributors of consequence.

Buy ARMSTRONG TOOLS from your Industrial Distributor

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

CHASERS IN OR OUT IN SECONDS

Quick chaser insertion and removal means less down time on threading jobs, and it's a big feature of GEOMETRIC "D" type Die Heads.

Just pull up a stop plunger and snap the chasers in or out of their slots in less time than it takes to tell how. No face plate to remove, no screws to replace, no parts to adjust.

Simple to operate, rugged, precision built. That's the GEOMETRIC "D", industry's BASIC DIE HEAD, the one to which all others are compared.

Write for full details. Specify Bulletin D

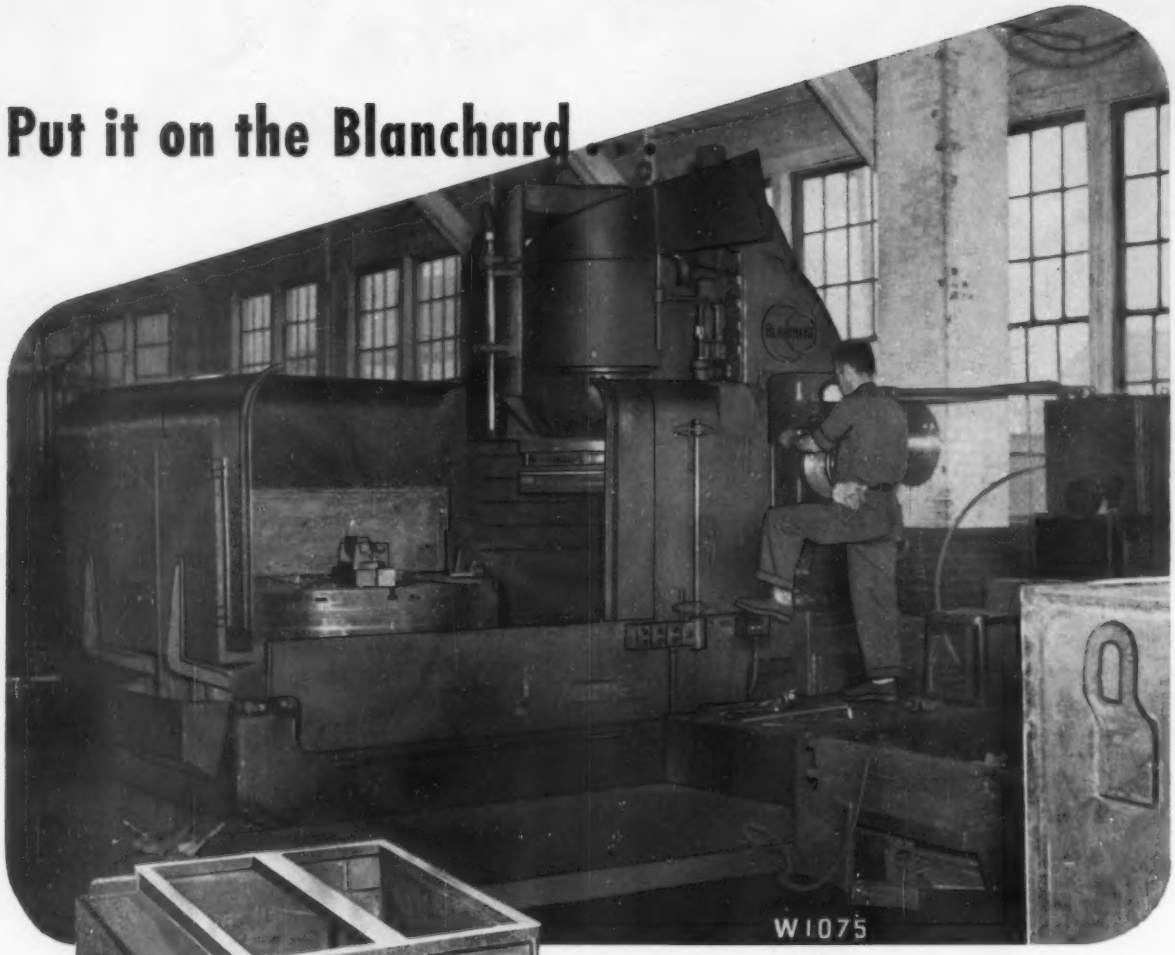
Greenfield Tap and Die Corporation

GEOMETRIC TOOL COMPANY DIVISION

NEW HAVEN 15, CONNECTICUT

GEO MET RIC

Put it on the Blanchard . . .



it takes 1/5th the time!

Here is another example of the special jobs Blanchard Surface Grinders perform *in less time*, to exacting specifications.

These explosion-proof control cases are used in the coal mining industry. Each steel weldment case is 36" x 48" x 24" deep. Because gaskets cannot be used, surface finish, and flatness must provide a dust and gas explosion-proof metal seal.

A Blanchard Surface Grinder, the No. 32-60, removes approximately 1/8" of stock — in *one-fifth* the machining time formerly required.

Send a sampling of your parts for free test grinding and our recommendations.

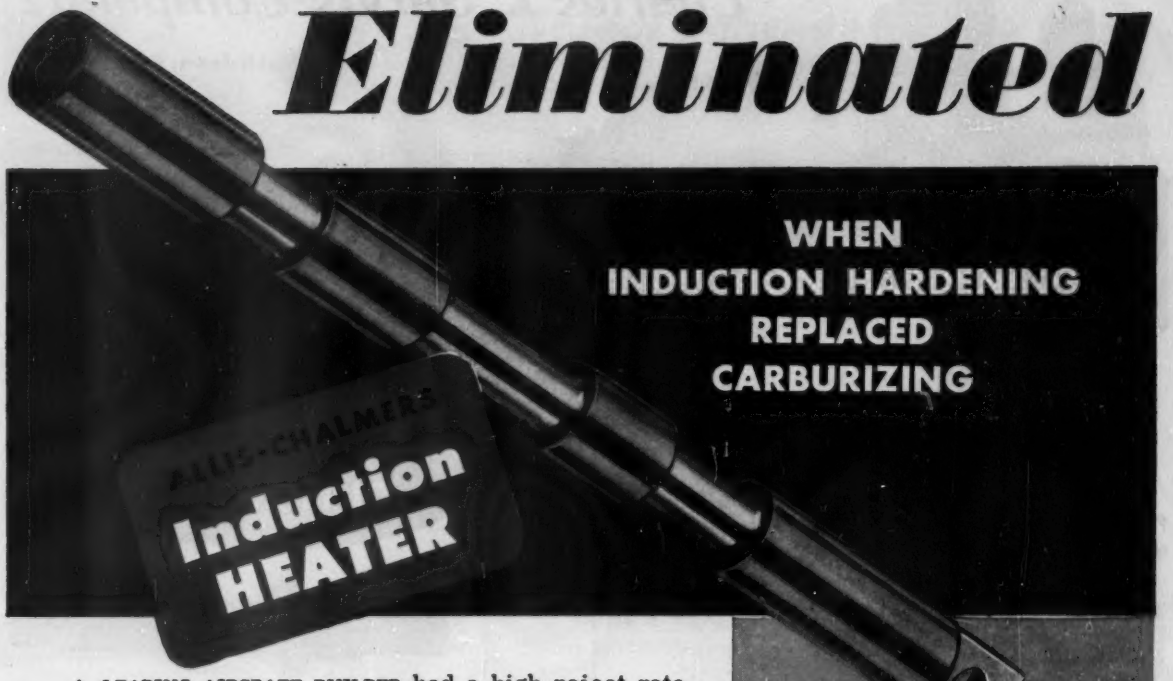
Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

Rejects Eliminated



WHEN INDUCTION HARDENING REPLACED CARBURIZING

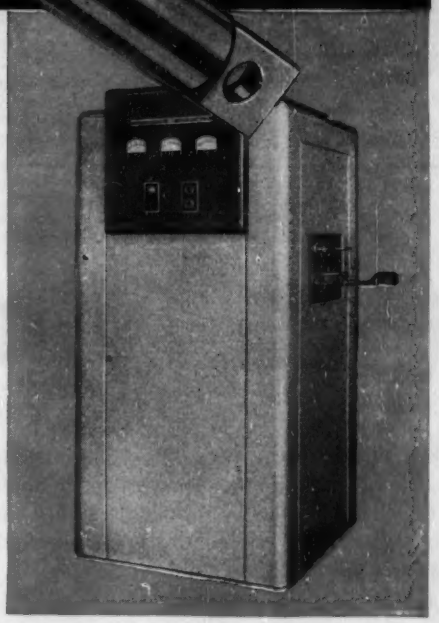
A LEADING AIRCRAFT BUILDER had a high reject rate while carburizing hydraulic control valves. In addition, production was slow. Rework after rework was necessary because material was brittle and straightening was difficult, if not impossible. Depth of carburization was also hard to control . . . and it was a dirty job, too!

Picture Changed Overnight

Now, with Allis-Chalmers induction heaters rejects or reworks are eliminated; depth of hardening is held between .078 inches and .080 inches; production is greatly increased; and it's a clean, pushbutton type job.

Where there's a problem with warpage, scaling, or heat control, even a relatively low production item can often be profitably processed using induction heat.

Bring your problems to Allis-Chalmers. Call your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin.



ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-4404

Allis-Chalmers
Milwaukee 1, Wisconsin

Please send information on ☐ brazing ☐ hardening ☐ annealing

Name..... Title..... Company.....

Street..... City..... State.....

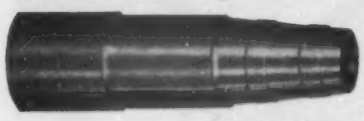
See how times have changed for the Charles L. Jarvis Company!

Middletown, Connecticut

THE REASON:
a double duty
CLEVELAND
DIALMATIC!

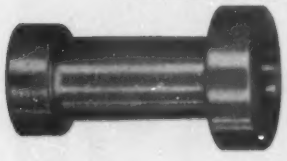
Parts shown half size

BAR JOBS:

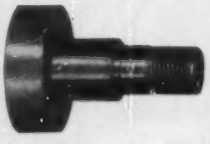


Part: Handpiece Shell
Material: CRS
Turret lathe time: 10 min.
AB Cleveland time: 3 min.

Part: No. 2 Morse Taper Shank
Material: CRS
Turret lathe time: 6 min.
AB Cleveland Time: 2 min.

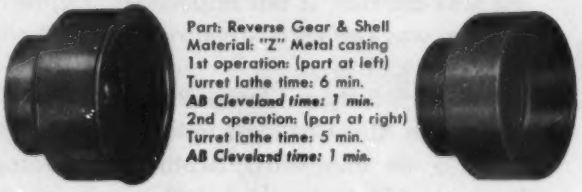


Part: Pinion Gear
Material: SAE 4160
Turret lathe time: 12 min.
AB Cleveland time: 3 min.



Part: Drive Flange
Material: CRS
Turret lathe time: 13 min.
AB Cleveland time: 2 min.

CHUCKING JOBS:



Part: Reverse Gear & Shell
Material: "Z" Metal casting
1st operation: (part at left)
Turret lathe time: 6 min.
AB Cleveland time: 1 min.
2nd operation: (part at right)
Turret lathe time: 5 min.
AB Cleveland time: 1 min.

Many component parts for Jarvis "Multi-Tappers" and other power tools and accessories manufactured by The Charles L. Jarvis Co., Middletown, Conn., are now being produced on the Model AB Cleveland *Dialmatic* shown above.

At the Jarvis plant, this Cleveland Single Spindle Automatic is doing *double duty!* As components are machined both from bar stock and rough castings . . . and as this Cleveland can be quickly converted from a 3" bar machine to a *chucking automatic* having 6" swing . . . a wide range of parts are turned out at *outstanding time savings!*

Typical parts are shown above, listing comparative machining times. *Note the time savings!* Let a Cleveland Sales Engineer show you how a Cleveland Dialmatic can produce similar savings for *your* shop. For machine details and specifications, write for bulletin describing the 3" Model AB. Other sizes and models available.

Remember: *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

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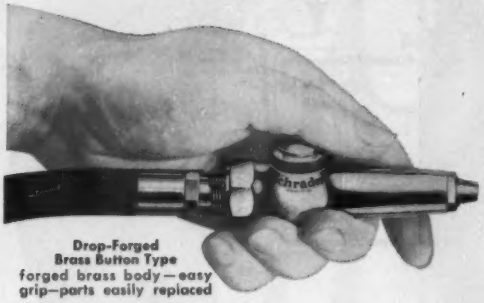
Select Schrader Blow Guns

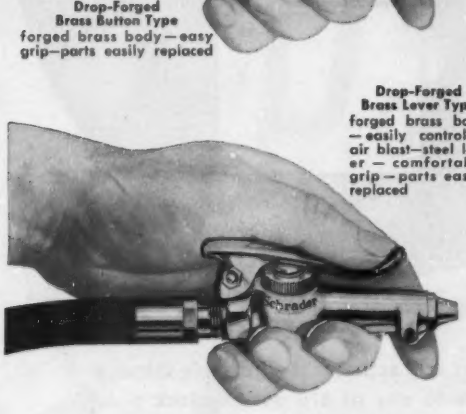
They fit your hand
They fit your job

Drop-Forged Stainless Steel
practically indestructible—simple construction—parts easily replaced—protective hand guard and hang-up hook—comfortable grip—countersunk nose



Drop-Forged Brass Button Type
forged brass body—easy grip—parts easily replaced

Drop-Forged Brass Lever Type
forged brass body—easily controlled air blast—steel lever—comfortable grip—parts easily replaced



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A Schrader Blow Gun puts air where you want it . . . when you want it . . . and *just the way* you want it to do the job best. Choose from thirty-six designs and styles. Schrader Blow Guns take years of the toughest treatment you can give them—and come back for more. Here's why . . .

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Company _____

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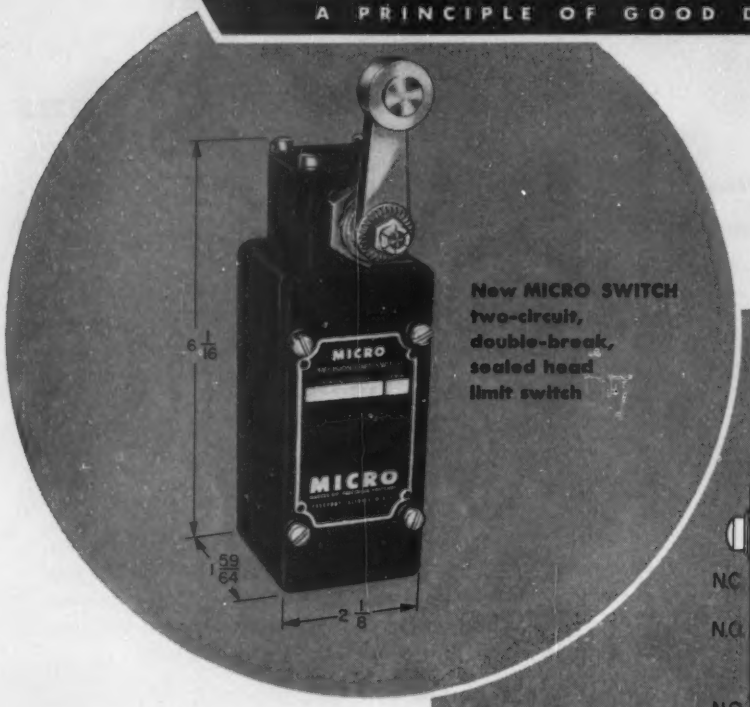
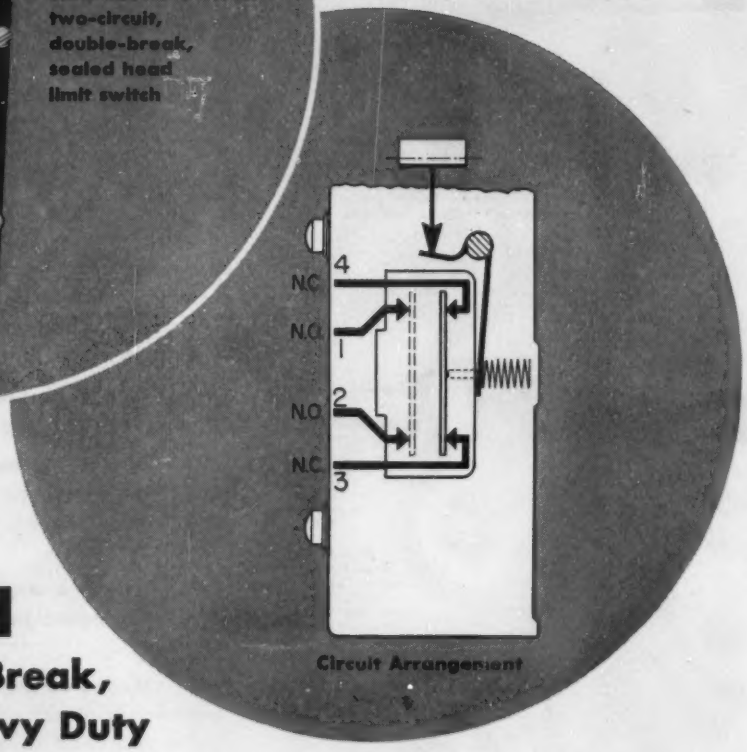


New MICRO SWITCH two-circuit, double-break, sealed head limit switch



Circuit Arrangement

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Two-Circuit, Double-Break, Sealed Head, Heavy Duty Precision Limit Switch

MICRO SWITCH heavy duty limit switches have long been favored by plant engineers and maintenance men to make present equipment more automatic, safer and more productive.

This new two-circuit, double-break, sealed head switch makes it possible to apply this versatile switch to applications that require the switching of two isolated circuits. The switching unit is protected by enclosure in a sturdy aluminum housing. Seals are provided to keep out oil, water, grit, chips or other foreign matter.

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There are 180 MICRO SWITCH distributors located in 161 key cities to supply this new switch or any of the wide variety of MICRO SWITCH products for limits, safeties or interlocks. Locate him under "Switches, Electric" in your phone book.

MICRO SWITCH provides a complete line of extremely reliable, small-size, high-capacity, snap-action precision switches and mercury switches. Available in a wide variety of sizes, shapes, weights, actuators and electrical characteristics. For all types of electrical controls.

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But . . . as a matter of fact . . . it is neither new nor unusual for Logan to make . . .

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TO YOUR STROKE SPECIFICATIONS

Wire or Phone Orders Received Before Noon Will Be Shipped the Same Day

WHY TAKE A STROKE YOU DON'T WANT?

Always, when our customers request it, we have made delivery within hours on Air Cylinders to customer's stroke specifications (up to and including 8" bore). Hydraulic cylinders (small but not too small) take a little longer. Highest quality, dependability and prompt delivery are continuing factors on which Logan has built and maintains its reputation as the foremost manufacturer of air and hydraulic equipment.

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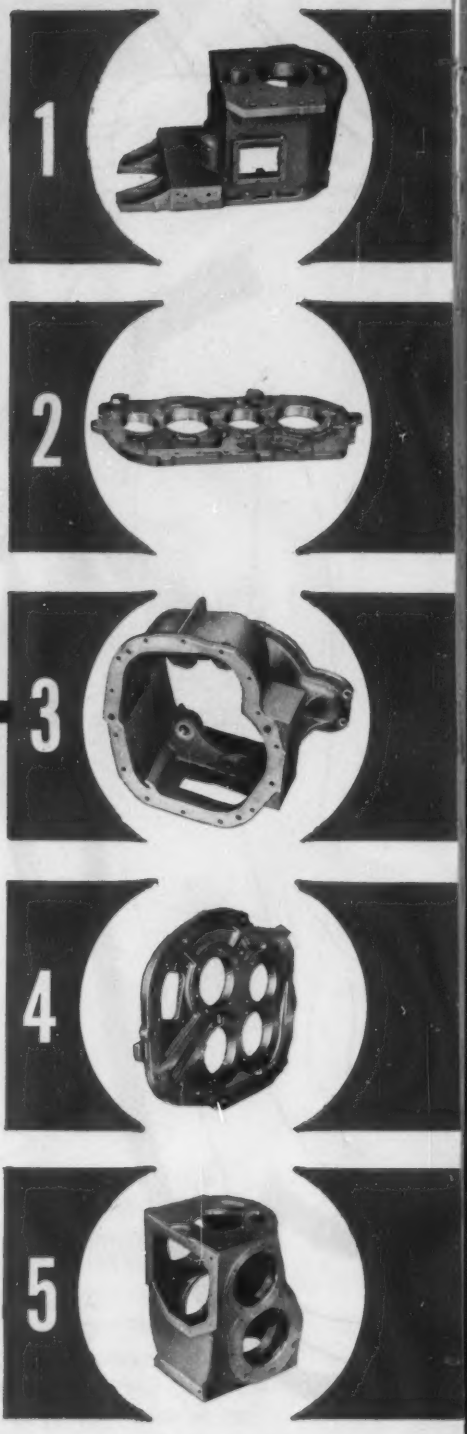
5 DIFFERENT WORKPIECES PROCESSED ON ONE W. F. & JOHN BARNES SPECIAL MACHINE



Versatile Tooling and Special Machine Precision Lower Costs, Improve Quality of Motor Grader Transmissions

This W. F. & John Barnes unit, designed and built for the J. D. Adams Manufacturing Co., Indianapolis, Ind., combines all the built-in advantages of a special machine . . . yet it machines not one, but FIVE separate and dissimilar workpieces that together form a complete transmission housing. Ingenious planning of spindle arrangement, tooling, and fixtures enables only 31 spindles to perform a total of 53 operations on the five workpieces. Special fixtures and numbered gauges locate the work and tooling quickly and accurately . . . complete change-over from one housing section to another averages only six hours.

Engineering and building a distinctive machine like this just doesn't happen by accident . . . it's the result of over 75 years of accumulated knowledge in a highly specialized field. That's why at Barnes you'll find the creative skills, plus complete and adequate facilities, for designing and building better machines to lower your production costs . . . improve product quality.

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Find out how Barnes' unique creative and specialized resources can help you cut costs. Your problem will be given expert and individual attention.

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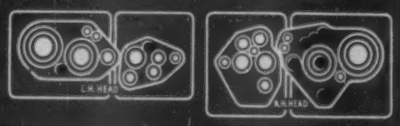
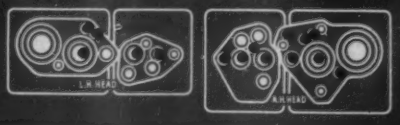
MULTIPLE SPINDLE DRILLING • BORING • TAPPING

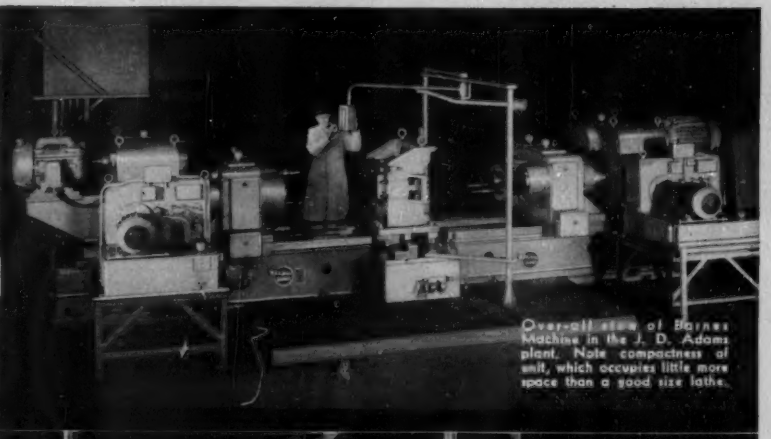
LOWER TRANSMISSION CASE



Drawings illustrate the spindle arrangement in the opposed heads and how they are individually tooled to perform chamfering, rough, semi-finish and finish boring, and facing operations in the five different workpieces. Two auxiliary heads mounted at right angles to the machine bore dowel holes in the Final Drive Housing.

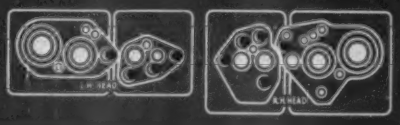
INTERMEDIATE PLATE





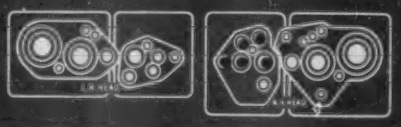
Over-all view of Barnes Machine in the J. D. Adams plant. Note compactness of unit, which occupies little more space than a good size lathe.

UPPER TRANSMISSION CASE

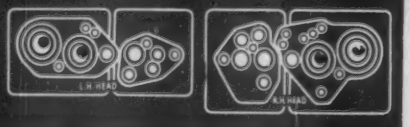


Closeup of fixture used for Upper Transmission Case. Note rings for quick removal. Spindle housings are divided and gear boxes separated from housings to minimize heat rise.

UPPER TRANSMISSION CASE COVER



FINAL DRIVE HOUSING



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All of the feeds and all of the 20 to 1 range driving motor speeds are electronically selected and controlled at the cutting tools! Both are infinitely variable and can be changed in fine increments while the tools are cutting!

Push buttons on the control panel traverse the carriage right or left and the tools in or out.

Only for thread cutting or shifting in or out of the face plate drive, does the operator have to leave his working position at the cutting tools.

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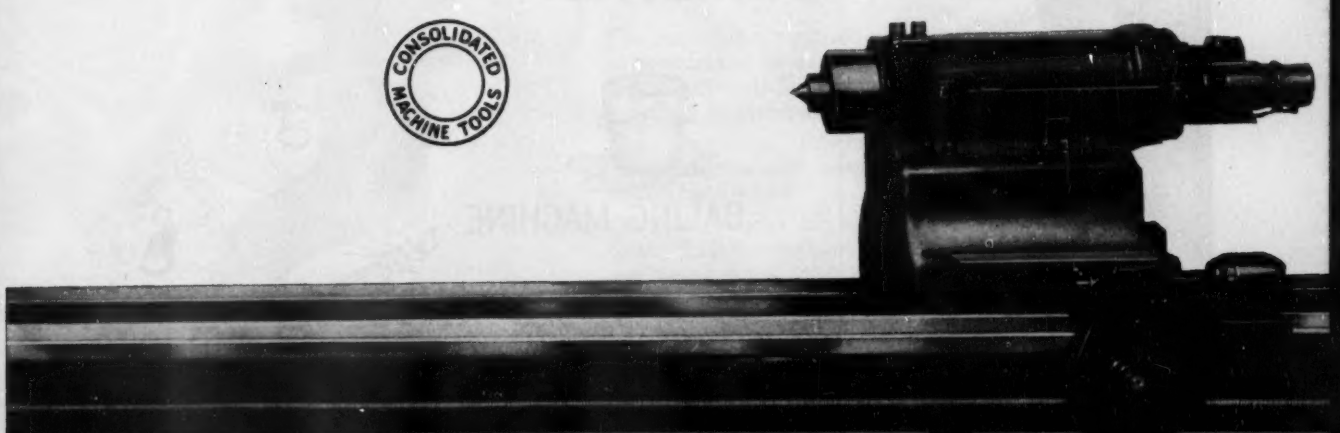

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EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Foolproof Systems

I note the remarks by John K Westerley (*AM*—April 26 '54, p78), and no doubt the system appears foolproof. No doubt before GM's disastrous fire they considered their system was foolproof but, unfortunately, found out later it was not so. It is one thing to put in a system, and another thing to have it observed in its entirety.

Many years ago when I was in the USA at one of the prominent machine tool builder's, I walked into one department and the foreman told me they had just received an order for a batch of armament machines. I remarked that, as they had all the drawings, it would be a straightforward job. The reply was, "Hell, we don't work to the drawings, we make a machine that will work."

While in England in 1938 on a major armament project, I found this state of affairs: Drawings were produced to the best ability in the drawing room, then forwarded to the shop for production. In some cases, the shop found it was not practicable to work to the limits on the drawings. They then had a conference with the chief inspector and pointed out the difficulties. The inspector, being a very knowledgable person, examined the complaints and, if he agreed with them, gave them a concession on the drawing limits. Unfortunately, the official drawings were not altered in accordance with these concessions, and any firm supplied with the official drawings and not being made aware of these concessions, was faced with many headaches in manufacture.

The purpose of my letter (*AM*—March 15 '54, p 100) was not to criticize the systems but to try and find out, "How does one make it an effective 100% system?"

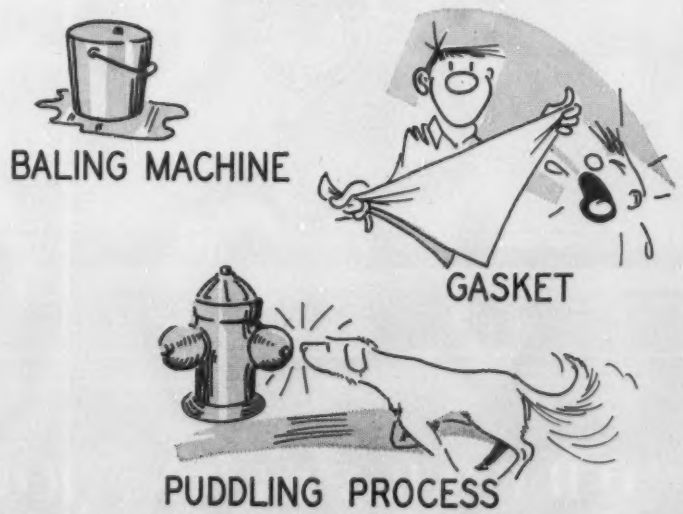
Jack Finlay
Mt Victoria, NSW, Australia

Boiinnggg?

In Practical Ideas (*AM*—June 7, '54) you describe a very ingenious method of milling a helical groove in a 20-ft-long rod. However, the author clearly states that a *helical* groove was wanted. I do not believe that

GRINETICS

BY D G SMITH



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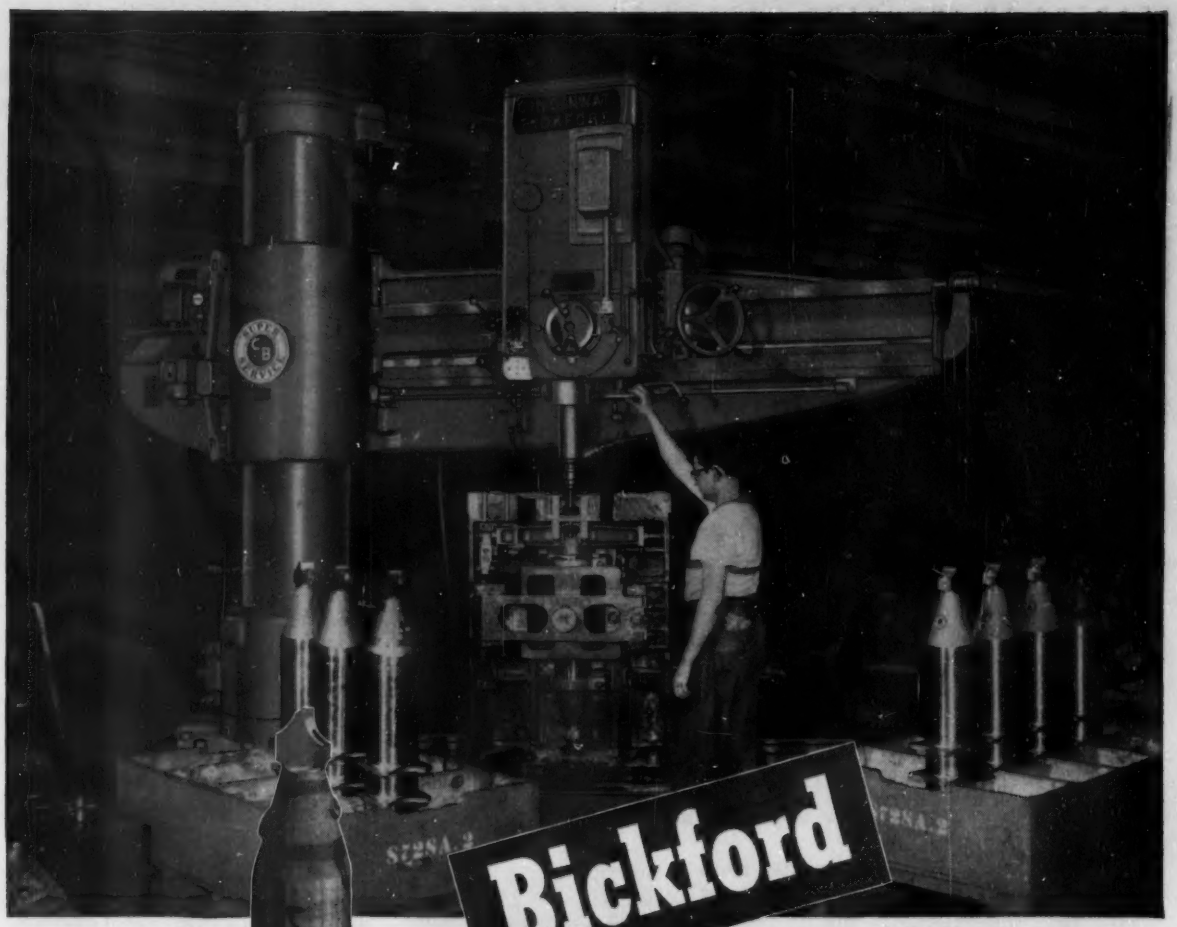

Photos courtesy— The Cleveland Pneumatic Tool Company, Cleveland, Ohio.

Bickford gives *complete* satisfaction...

The convenient centralized controls, the wide range of speeds and feeds, and the high visibility head of this Cincinnati Bickford Radial Drill are all contributing to fine performance on this job.

The Cleveland Pneumatic Tool Company say "Performance and ease of handling are all that could be desired."

On this cylinder for an aircraft nose type landing gear, drilling, reaming and spot facing operations are being done.

Cincinnati Super Service Radial Drills are accurate, powerful and profitable in the shop.

Write for Bulletin R-29.

CINCINNATI BICKFORD

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Noblewest's Roll-O-Mark with horn-style work holding fixture for marking the O.D. surface of large diameter rings.

FEATURES

- ***Extra large work capacity***
- ***Greater versatility***
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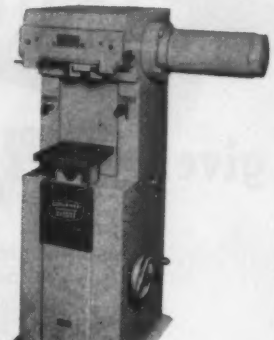
Marking the surface of large diameter rings is just one of the many applications that are being done faster, better and at lower cost in many industries today with the new heavy duty all-pneumatic Roll-O-Mark. This one machine can be tooled for marking round or flat surfaces . . . precision graduating . . . serial numbering . . . knurling . . . and embossing.

Whatever your needs for metal marking, Noblewest makes the machines, marking dies, and work-holding fixtures for doing the complete job. And remember, Noblewest Roll-Marking is *permanent* marking—*good for the life of your product.* There is a Noblewest representative near you. Write Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Conn.



All-pneumatic, Model 365 is the heavy duty version of the famous Model 50P1.

Be sure to visit Noblewest Booth 520 at The Tool Engineers' Show.

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ORIGINATORS OF THE ROLL MARKING PROCESS

the method shown—twisting the rod, milling a straight groove, and then letting the rod snap back—will result in a true helical groove.

As far as I can see, and I may be wrong, the groove in a bar held firmly at one end, with the other end twisted at 60°, will resemble a helix, but with the greatest angle of twist in the exact middle of the bar, with the twist angle decreasing toward both ends, like this:

I don't mean to criticize Mr Vetsch's very clever solution! It may be that he didn't need a true helix, but merely a twisted groove.

If a somewhat closer approach to a helix is wanted, the rod could be clamped firmly in the exact middle and each end twisted 30°, clamped, and the groove then milled.

The result would be a groove with a total twist of 60°, and the errors would be equally divided between the two halves of the rod. In other words, the greatest angles would be 5 ft away from each end, and the smallest angles would be at the ends and in the exact middle of the rod.

J Gustav Kopsch
Baldwin, LI, NY

This is really a complicated question, so, when we received Mr Kopsch's letter, we asked the opinion of a specialist. The man we asked was M Gerard Fangemann, manager, Spring Division, John Chatillon & Sons, manufacturers of springs and scales. Here is his reply:

We have read Mr Kopsch's letter with interest. He states that the greatest angle of twist occurs in the exact middle of the bar. The picture he has drawn is correct, and it certainly does appear that the angle of twist is greatest at the middle, but this happened because of the foreshortening of the curve resulting from the roundness of the bar. If Mr Kopsch had drawn several other lines on either side of the given curve, he would have noticed that the angle of each line was greatest where the lines crossed the axis of the bar. In particular, a line which starts at the intersection, in any illustration of the axis and one of the ends, would start with the greatest "appearing" inclination equal to that shown at the middle of the bar in Mr Kopsch's picture. In other words, the angle of helix would be the same

at the ends, at the middle, and, in fact, at all other points.

If a straight line is scribed in the surface of a round wire, so that it is parallel to the axis of the bar, the line will take the form of a true helix when the wire is twisted from the ends. In other words, the line after twisting will have a consistent inclination with respect to the axis. This condition follows from the basic assumptions made in derivation of the angle of twist of a shaft, namely:

$$\phi = \frac{T \times L}{E_s \times J},$$

where ϕ is the angle of twist, T is the twisting moment, L is the length of the bar, E_s is the modulus of elasticity in shear, and J is the polar moment of inertia of a cross-section of the bar.

These assumptions are that a circular section of a bar before twisting remains circular during and after twisting, and a diameter in the section remains a straight line during and after twisting (assuming, of course, the bar is not overstressed).

We would like to add the following: You will note that the discussion has been limited to *lines on the surface of the bar*. After the bar has been twisted, there is a certain stress pattern in the circular section, namely that the shearing stress varies directly as the distance from the axis. Now, when a groove is cut, in the twisted (stressed) bar, the stress pattern will be disturbed. After grooving, when the bar is unclamped, it may not untwist to its original condition. The size of the groove should be the determining factor. If the groove is slight, the bar should return substantially to its original condition. Any deviation from the initial condition could be compensated for by varying the angle of twisting.

Finally, it is our opinion that the article as presented is correct, but we would like to point out that it should have been mentioned in the original article that the bar should be stress-relieved before the clamping and milling are done. Also, the time element is important because a slight amount of drift will occur during the time the bar is twisted and clamped. The amount of drift will vary for each material, but it is the writer's opinion that the amount of drift will be extremely small and, for all practical purposes, negligible.

M Gerard Fangemann
general manager, Spring Div,
John Chatillon & Sons,
New York 38

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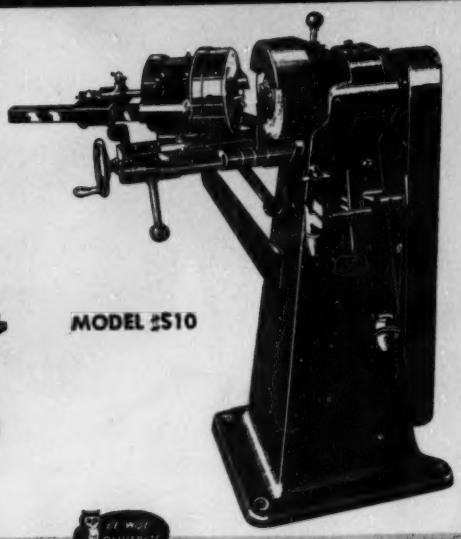
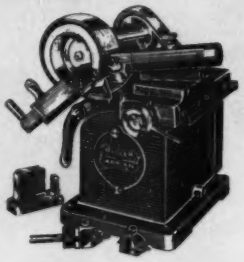
with

OLIVER DRILL POINTERS

Twist Drills *machine-ground* the Oliver Way reduce drill costs because they cut faster, last longer and produce more perfect holes.



MODEL #510



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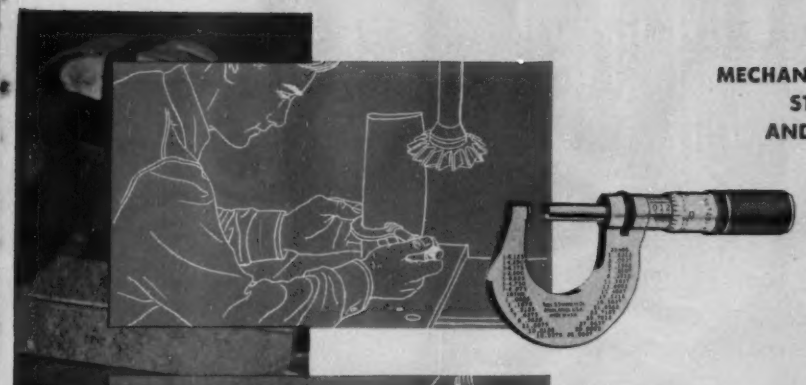

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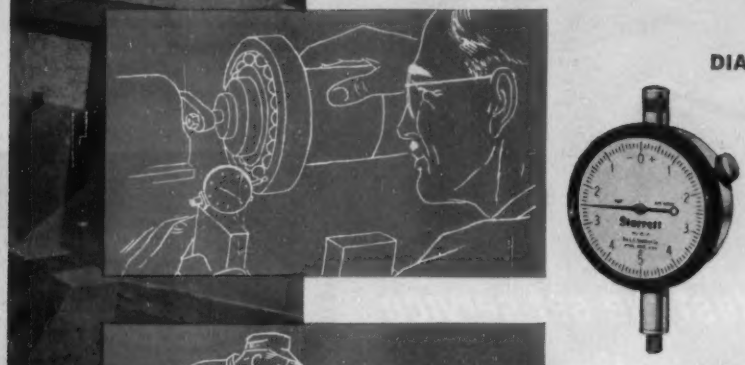

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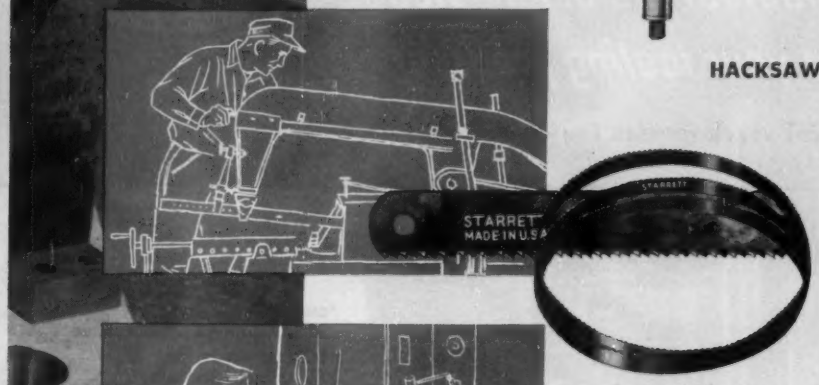
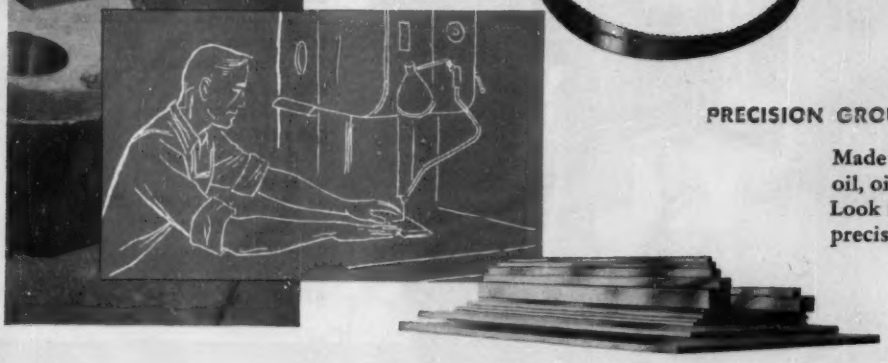
Standard for quality and precision — a complete line for every gaging or production inspection application.



HACKSAWS, BAND SAWS AND BAND KNIVES

Precision made by the World's Greatest Toolmakers for top performance, uniformity and maximum cutting economy.



PRECISION GROUND FLAT STOCK

Made in four types, 295 sizes — air, oil, oil or water, and water hardening. Look for STARRETT, the mark of precision, on every piece.

WHEN YOU MEAN PRECISION YOU SAY STARRETT

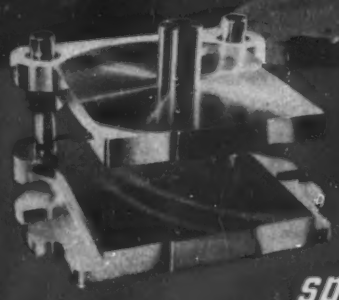
THROUGH TOOL INDUSTRIAL DISTRIBUTOR

Starrett®

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

THE L. S. STARRETT COMPANY
ATHOL, MASSACHUSETTS, U.S.A.

At Danly's Chicago Plant . . . final broaching to assure accurate sizing and parallelism of guide post and bushing holes



World's fastest die set service speeds up your tooling program

Mass production plus local stock means faster delivery

DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

At a Danly Branch Plant . . . complete stocks of die set components ready for assembly to your order

*CHICAGO 50
2100 South Laramie Avenue
*CLEVELAND 14
1550 East 33rd Street
*DAYTON 7
3196 Delphos Avenue
*DETROIT 16
1549 Temple Avenue
*GRAND RAPIDS
113 Michigan Street N.W.
INDIANAPOLIS 4
5 West 10th Street
*LONG ISLAND CITY 1
47-28 37th Street

FAST, NATIONWIDE DELIVERY FROM THESE BRANCHES

Danly's new, faster service starts at the main Danly Plant in Chicago where two unique, high-speed, mass production lines are devoted exclusively to the manufacture of interchangeable, precision die set parts. Stocked by Danly Branch Plants in major toolmaking centers, these interchangeable parts are quickly assembled to make up the size and type of die set you need—and delivered to you only a few days after your order is received. Make a note right now of the Danly Branch nearest you from the list given on this page. Next time you need die sets, give your Danly Branch a call. See how they can meet your needs from stock . . . and save you time with fast, local service.

*LOS ANGELES 54
Ducommun Metals & Supply Co.
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MILWAUKEE 2
111 East Wisconsin Avenue
*PHILADELPHIA 40
511 W. Courtland Street
*ROCHESTER 6
33 Rutter Street

Indicates complete stock

Spot News of Metalworking . . .

• ALUMINUM-PLATE WELDING . . .

Plate aluminum of 1 to 3-in. thickness has been successfully fabricated and welded by a Midwest firm. First use is for non-magnetic bases for Navy diesel engines. It is done with special rods at low temperatures, has possibilities for replacing castings in some uses.

• '55 AUTO MODEL TOOLING . . .

Conservative guess around Detroit is that industrywide tooling for the 1955 auto models will run $1 billion to $1.1 billion or more. One reason: at least nine nameplates will have new body shells.

• PROCUREMENT SCHOOL . . .

Ways of obtaining and financing government contracts will be explained in a six-lecture course at the non-profit Practicing Law Institute, New York, Monday evenings beginning November 15. The businessmen's course includes analysis of contracts, subcontracting problems, how to determine prices.

• CERAMIC COATINGS . . .

"Solution ceramics," flexible coatings that can be applied to almost any surface at low temperatures, have been developed at Illinois Tech. Their features: inexpensive, easy application; far lower coating temperature than for porcelain enamel; easy control of coating thickness; heat resistance; chemical resistance; lack of brittleness; high adherence to metals.

• WANTED: SKILLED WORKERS . . .

Ford's newly opened Cleveland stamping plant is hiring diemakers, die tryout men, resistance-welder repairmen and layout inspectors "as fast as they walk in the doors." Present workforce of 300 will be stepped up fast as new lines go into production. Ultimate workforce: 3000.

• STANDARD FASTENERS . . .

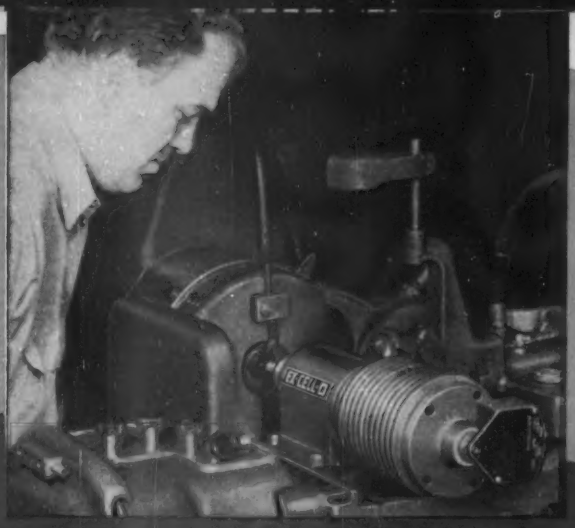
US makers of fastening devices are taking an increasingly dim view of international standardization of their product because (1) foreign firms could flood the US with fasteners at 1/3 off US prices, and (2) it could mean loss of export markets for American-made fasteners.

• GAS TURBINE . . .

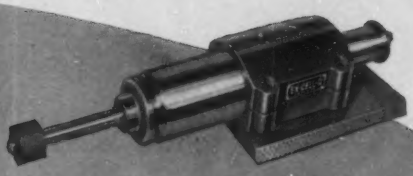
Boeing Airplane Co predicts its gas turbine will be competing with piston-type airplane engines within five years. Principal bug — high fuel consumption — is being ironed out fast.

• NEW WHITE ALLOY . . .

Enroute from England for the Metals Show in Chicago is Britain's new copper-manganese-tin alloy. It has good mechanical properties; can readily be cast, forged, rolled or stamped; is corrosion resistant; can be plated; costs the same as nickel-silver but uses manganese instead of scarce nickel.



Grinding small holes with an Ex-Cell-O 25,000 RPM High Frequency Motorized Spindle



Single-body, belt-driven internal grinding spindle.

Double-body, belt-driven internal grinding spindle.

25 hp heavy duty precision spindle with 24" grinding wheel.

PRECISION SPINDLES

Built for Your Work

25,000 rpm high frequency inbuilt motor spindle.

Totally enclosed inbuilt motor surface grinder spindle.

Precision inbuilt motor spindle for cutter grinder.

Heavy duty motorized precision spindle available up to 20 hp

Get the most from your precision grinding operations by using the Ex-Cell-O Spindle that's made especially for the job.

Ex-Cell-O Precision Spindles have long been the original equipment choice of leading grinder manufacturers. They are rigid and smooth-running. For high precision work they are fitted with standard Ex-Cell-O Precision Ball Bearings; for slower speeds and heavier cuts they are equipped with heavy-duty Ex-Cell-O Precision Ball Bearings. They require no lubrication or adjustment. Phone your Ex-Cell-O representative or write to Ex-Cell-O in Detroit today for catalog 25962 listing hundreds of standard grinding spindles.

XLO

EX-CELL-O for PRECISION

EX-CELL-O

CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

53-32

Washington . . .

A casual look at the raft of mobilization stories and orders coming out of ODM in recent weeks might make you think the government has a mammoth new machine tool buying program in the works. But this isn't the case at all. Skeptical observers consider the fuss ODM's way of letting the public know it's still in existence.

Latest item is a new and highly-publicized order— Defense Mobilization Order No. VII-7 — which allegedly sets up a program to keep vital defense plants on standby. Of greatest interest to machine-tool men is a provision in the order "directing procuring agencies to determine . . . gaps in government-owned packages of production equipment and within the limit of funds available to purchase the missing equipment, giving priority to the long lead-time tools or those not used in general manufacturing."

If all this sounds familiar, it's because the program has been in effect for two years and more. According to officials, the new order "codifies" and "formalizes" the program. But it hasn't really gotten off the ground. Last year's $250-million reserve tool fund in the military budget was supposed to be used for this purpose.

• • •

Roughly 30% of metalworking equipment under export restrictions have been decontrolled (see p198). These machines — mostly small millers, lathes, and grinders — can now be shipped to friendly nations without a license and most likely can be licensed for export to Soviet Bloc countries. You can get a detailed listing of all items decontrolled from the Office of Publications, Commerce Dept, Washington, DC, for 25 cents. Ask for *Current Export Bulletin No. 736 — Supplement to the Comprehensive Export Schedule.*

• • •

Michigan's Governor G Mennen Williams has set up a Washington office to lobby for government contracts for Michigan firms. He claims Michigan unemployment is rising badly, wants preference for firms in his state on new Pentagon business. Michigan's state government had a Washington office to help land contracts during the peak Korea procurement days. It did a good job then. Williams thinks there's a job to be done now.

This is what really prodded Williams into action: in recent months $300 million worth of government contracts with Michigan firms have been cancelled; at the same time over $1 billion in new business has been placed with New York and California companies. New York's state government has had a Washington office to lobby for native firms for a long time. California's Chamber of Commerce does the same thing here.

• • •

If you're a small firm switching from defense to civilian production and can't get local credit for new working capital, you may be able to land a government loan. SBA has just granted $110,000 to such a firm — Wittcrosse Engineering Inc, LaCrosse, Wis, which is converting from manufacture of tools, dies and jigs to production of home appliances.

• • •

First census of manufacturers since 1948 will be taken early next year. At that time, you'll get a detailed questionnaire from the Census Bureau covering 1954 production, employment, payrolls, value added by manufacture, consumption of fuel, power, materials, etc. In all, nearly 300,000 firms manufacturing over 450 different products will be canvassed. In addition, Census will make similar surveys of mineral and retail, wholesale and service industries. Before its adjournment, Congress voted $8.4 million to do the whole job. But that was only after administration and business leaders put on some heavy pressure. Earlier, the House Appropriations Committee had turned down money for the three censuses.

• • •

The hard-to-fill skilled jobs are getting easier to fill. Though some manpower skills are still tight, fewer firms are going out of town to land skilled workers. The trend shows up in new Labor Dept figures: in August 1953, the department listed 2152 job openings for machinists that couldn't be filled locally; in August 1954, only 316 machinist jobs were so listed. Figures are similar in related fields: tool and die makers, 2163 unfilled job openings last year, 1173 this year; draftsmen, 1742 last year, 1173 this year; mechanical engineers, 1725 last year, 1245 this year.

• • •

It's getting tougher to land draft deferments for workers with essential, hard-to-replace skills. Only 25,000 are now deferred from military service because of occupational specialties. Included are 7000 who are apprenticed to critical skills like tool and diemaking.

To get an occupational deferment for an employee, you have to wade through a discouraging mass of red tape. The local Draft Board gets involved, of course. Then, the military procurement agency you do business with. The agency must investigate and certify that the employee in question is a key man who should be deferred to assure production of an essential product.

SHEFFIELD

AUTOMATION Gages

Assure Fast Accurate Machining

Sheffield Automation Gages are package units, ready-to-use and economically priced, for the control of grinding, boring, drilling, honing, milling and turning operations.

Mounted on machine tools, they measure work part dimensions and space relationships and instantly translate this information into electrical impulses which in turn:

- **Energize signal lights**
- **Actuate solenoid ejection or classification mechanisms**
- **Start and stop the machine tool**
- **Provide feed-back control**
- **Control cutting tool or grinding wheel positioning and compensation, also time cycle.**

A Typical Application

Here the bore of transmission pinions is being honed and gaged automatically.

If the actual bore size, after honing, is within .0001" of either tolerance limit, white warning lights flash on.

If either tolerance is exceeded, a red or green signal flashes and the faulty part is automatically ejected.

When a predetermined number of rejects pass through in succession the machine is automatically stopped.

The actual size of each bore, as it is gaged can be read on a conveniently located air gage dial as built into the machine tool pneumatic circuit.

The Sheffield Corporation, Dayton 1, Ohio, U.S.A.

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

Sheffield AUTOMATION ENGINEERS will gladly consult with you about automatizing your production.

Detroit . . .

High-horsepower opponents can begin to sharpen the pencils they use to write letters of protest to auto makers. The average horsepower of 1955 models will be substantially higher than this year's figure.

The 1954 composite car averages 161.4 hp. Next year, the overall average will be about 188 hp.

As nearly as can be determined, '55 engines will be powered pretty much like this (listed in brackets are the advertised brake horsepower ratings for the most powerful engine in each '54 car):

Packard, 265 hp (212 hp this year); Chrysler, 255 (235); De Soto, 195 (170); Dodge, 180 (150); Plymouth, 150 (110); Lincoln, 240 (205); Mercury, 200 (161); Ford, 162 (130); Buick, 220 (200).

Olds, 200 (185); Cadillac, 250 (230); Pontiac, 175, (127); Chevrolet, 162 (125); Studebaker, 145 (120); Hudson, 175 (160); Nash, 175 (130); Kaiser, 140 (140); and Willys, 115 (115).

Interestingly, Chevrolet appears to be readying this line-up: its production V-8 will be rated at 162 hp; an optional V-8 power package, including a four-barrel carburetor, will develop 180 hp. Chevvy further is believed to be planning for its '55 line a 123-hp six-cylinder engine, and a modified version thereof, turning up 135 hp. Compression ratio on the standard V-8: 8 to 1.

By way of providing further argument in favor of more power, Chrysler engineers compared a 1953 New Yorker (180 hp) with a 1954 model (235 hp) and found that the latter reduced the time required to pass a 45-ft truck traveling at 50 mph from 7.2 seconds to 5.9 seconds. The time in accelerating from 40 to 80 mph has been cut from 20.7 seconds to 13.7 seconds, a time saving of 34%.

Chrysler people don't say 80 mph is sensible. They merely point out that the more powerful engine cuts down the time spent on the wrong side of the road, giving an added measure of safety to drivers who get caught out of line at the wrong time.

To measure horsepower increases, note that in 1918, average horsepower in US cars was 20. In 1930, it was up to 75. It was up to 115 hp in 1942. Only last year, it was 137 hp, about 50 hp lower than the average expected for next year.

• • •

Chrysler sources deny emphatically that the corporation intends to produce a sport car line in 1955 to compete with Ford's Thunderbird, Chevrolet's Corvette, or Kaiser or Hudson.

Published reports recently have stated that such a sports line is in the offing. Chrysler may come forth with another "idea" car or two — but nothing for the public in the sport car field.

Maj Gen E L Cummings, Chief of Ordnance, says he feels "there is a high degree of competition" in bidding for ordnance work. This is in answer to criticism that Chrysler and American Locomotive are placed at a disadvantage when bidding on an M-48 tank continuity contract — because Fisher Body is in production, while the other two firms have largely mothballed machine tools and other equipment.

Factors to be considered when evaluating upcoming proposals, said Cummings, include: quality, cost, past performance (of the producer) and the fact that one bidder is a "going concern."

Other ordnance officers suggested that the present continuity contract is "very substantial" and that the cost of bringing tools out of layaway would be a minor consideration.

Ranking ordnance officers were in Detroit to attend an arsenal-district-commodity command conference.

Asked whether ordnance is engaged in any project to develop an atomic powerplant, similar to that used by the Navy in its submarine Nautilus, Cummings said, "we have no application in Ordnance for that type of equipment, and what we are doing in that field is classified."

The Mechanics Educational Society of America, small but strong independent union, is contesting the right of American Motors management to decide where some of its products shall be built.

AMC proposes to shift part of its refrigeration work from Detroit to Grand Rapids. In a petition filed in Federal Court, MESA contends that under the current agreement, union officers are to be consulted before any company practice can be changed. An AMC spokesman said the move had been discussed with workers and MESA officers.

MESA's suit asks damages of $2,538,000 (compensation for estimated wage and union dues losses) — or else that the company be restrained from transferring production facilities.

The action is reminiscent of previous unsuccessful efforts by UAW's Local 600 to prevent Ford from establishing plants out of Michigan.

• • •

One major auto maker has no intention of leaving dealers with massive stocks of 1954 models when it swings into its 1955 sales push.

If successful, its programming will leave its thousands of dealers with no more than about 4000 current models on hand when the '55 lines goes into showrooms. In the case of this producer, 4,000 units is next to nothing. Dealers will be able to rid themselves of '54 inventories easily.

Automotive vehicle production will total about 4.7 million when this appears in print — about 700,000 units behind the pace a year ago.

5409

SHORT RUNS of PRECISION GEARS

Short runs of small, fine pitch, precision gears (gears up to 6" O.D. of the gear blank) carry high unit costs largely because of the top-heavy machine set-up time as compared to total production time. You can beat the machine set-up problem by routing small precision gear jobs to Hamilton Precision Gear Hobbers . . . for:

"Hamilton Precision Gear Hobbers feature independent selection of speed, feed, and indexing; reducing machine set-up time and offering a selection of cutting speeds and feeds to suit (exactly) the material being worked."

if you buy small quantities of precision gears, tell the man to "put your job on a Hamilton." You stand to profit two ways!

WANT FACTS?

Write for Hamilton Bulletin No. 5409.
Address: The Hamilton Tool Company,
830 South Ninth Street,
Hamilton, Ohio

IT'S A Hamilton Tool

USE IT WITH CONFIDENCE

Machine Tools . . .

Machine tool production was surprisingly high in the first six months of this year. It was, in fact, almost at the post-Korean peak level. The actual figure: $538 million.

Shipments during the entire year 1953 totaled $1.2 million.

The second half of 1954 is another story, however. Output is slipping considerably as backlogs dwindle. Most subcontract arrangements already have been terminated. Those that have not are likely to end before the year is out.

Shipments of machine tools the current calendar year probably will run to $850-$900 million.

• • •

Seldom has the situation in the machine tool industry (meaning metal-cutting machines) been spottier.

The industry's backlog is down to 3-4 months. Yet some companies building highly-special machines for the mass-production industries have enough orders to operate at a high rate for 12 months.

A few builders are holding to a schedule of 50 hours a week, and a handful are still at 45 hours. But the large majority are running 40 hours or less.

• • •

Little publicity has been given to the talks at Geneva, Switzerland, between European business men and the Red Chinese. These discussions took place during the Geneva Conference.

Le Jen Min, vice-minister for foreign trade of the Chinese government, and Chin Chi Ang, vice-president of the government-run Chinese National Export & Import Corp, headed the group of Chinese trade specialists.

Swiss manufacturers, particularly machine tool builders, are reported to have participated in these conversations. A Chinese Commercial Mission has been in Berne for some time.

German and Italian manufacturers met with the Chinese too. The discussion revolved around barter agreements.

Chinese, as one might guess, seem primarily interested in means of production, such as machinery.

West German machine tool industry shipped $230 million of machines during 1953. About half of the output went to foreign customers, compared with 35-40% before the war.

Exports of German machines were even higher in 1952 than last year. Breakdown of foreign shipments shows that metal-cutting tools comprised 75% of the total.

A good share of the German success in selling their machine tools abroad is said to be their willingness to build any type of machine customers want.

Japanese government, pressed by economic recession following the Korean truce, is planning an aggressive campaign to boost exports of all sorts of goods, including machine tools.

Some $21.8 million of industrial machinery is to be one of the export goals. This sum embraces machine tools. Chief markets: Southeast Asia, South America, the Near and Middle East.

• • •

The group headed by Frederick W Richmond of New York City is continuing to cut quite a swath in the metalworking production equipment industry.

Mr Richmond recently acquired the Birdsboro Steel Foundry & Machine Co, Birdsboro, Pa. He also has bought the assets of the Follansbee Steel Corp, Follansbee, W Va, producer of cold-rolled steel, enamel ware and metal stampings.

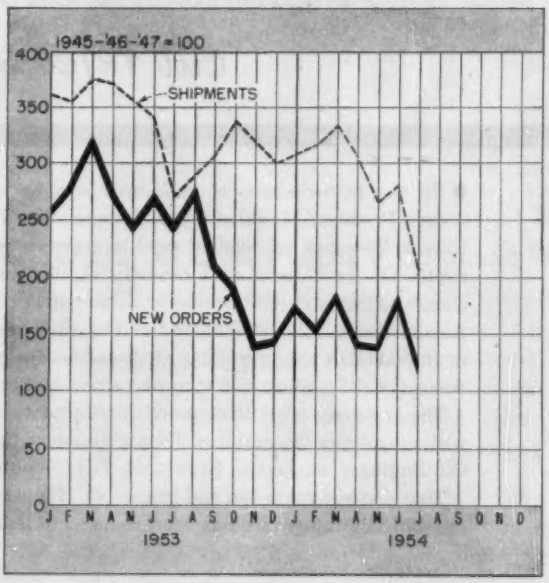
Conversations have been in progress between Mr Richmond and a midwest machinery builder looking toward the latter's acquisition by Mr Richmond's group.

For some time Mr Richmond has been chairman of the board, and has been in financial control of: Baker Brothers Inc, Toledo; Gear Grinding Machine Co, Detroit; and Brubaker Tool Corp, Millersburg, Pa.

BF

MACHINE TOOL INDEX
(1945-47 = 100)

(Source: National Machine Tool Builders' Assn.)



This little red wagon presented a big drawing problem!

A Standard engineer's advice helped cut rejects by over 90%

● In the manufacture of children's wagons at the Steger Products Manufacturing Company in Steger, Illinois, 20-gauge cold rolled steel is drawn to a 4½" depth. Of the 8-hour shift capacity of 1600 to 1800 wagon bodies, up to 20% formerly wound up as rejects. Also, it was necessary to clean the dies after every 10 to 15 bodies. A single small scratch on the die caused excessive die galling and torn or ruined bodies.

The company tried 10 or more drawing compounds without solving the problem. Then a Standard Cutting Oil Engineer suggested STANICOOL HD Soluble Oil.

That was six years ago and STANICOOL HD is still on the job. The reject rate has been reduced to less than 1% a day. Die galling has come down to almost nothing. Dies are now cleaned only once or twice daily. Again, Standard Oil's metalworking products prove they can do the hard jobs better!

STANICOOL HD Soluble Oil: for cutting and grinding operations, for certain forming operations. Mixes readily, non-irritating, anti-rust. To take full advantage of this many-purpose cutting fluid, call on the services of your Standard Oil Cutting Oil Engineer. If your plant is located in the Midwest, write Standard Oil Company (Indiana), 910 S. Michigan Avenue, Chicago 80, Illinois, to secure the services of the Standard Cutting Oil Engineer nearest you.

Standard's Bill Easterwood worked with the Steger Company on their drawing problem. Specially trained, Bill Easterwood is one of a corps of cutting oil and lubrication engineers headquartered near your plant throughout the Midwest. There's a specialist to assist you with *your* lubrication problem.

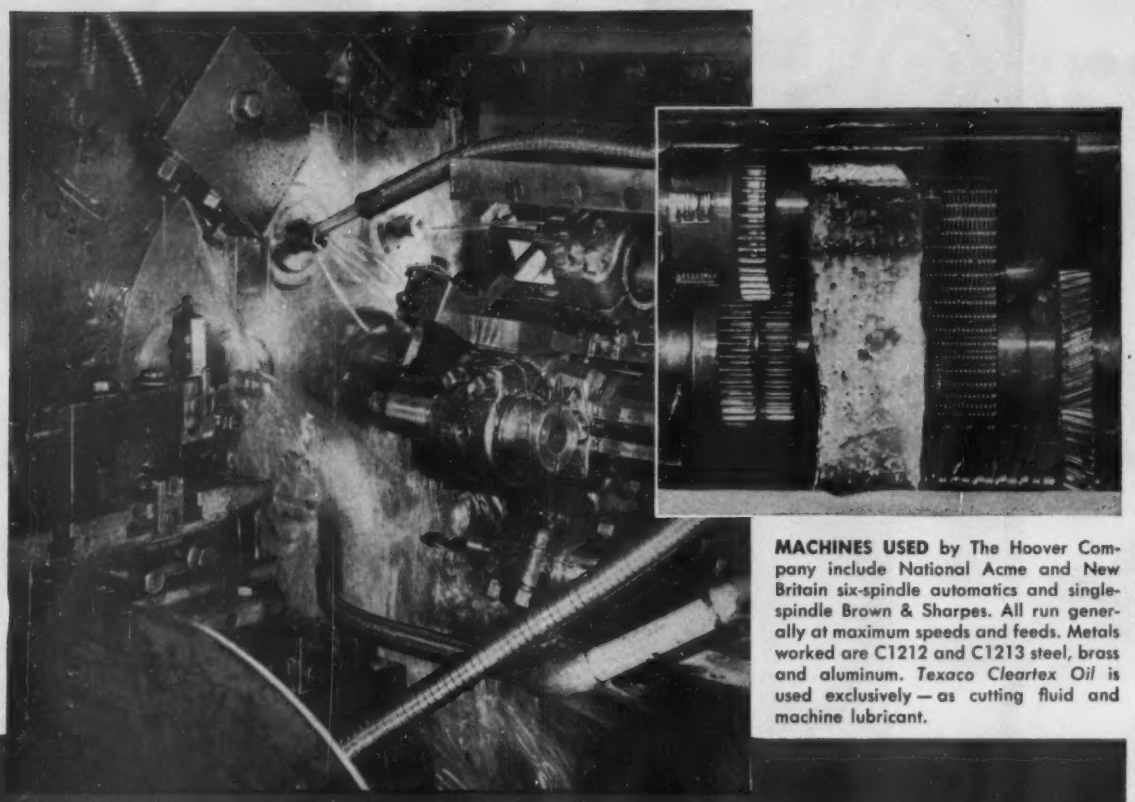
At Steger, die cleaning is of major importance because a single scratch can result in torn or ruined bodies during the processing. Since the introduction of STANICOOL HD, the time-consuming die-cleaning operation has been safely reduced to an *effective* minimum.

In this deep-draw operation STANICOOL HD is used just as it comes from the barrel without the addition of water. The 22-gauge cold rolled steel is drawn to a depth of 4½". The sheets are dabbed with STANICOOL HD as they are put on the press. Breakage which formerly had been a major problem has been reduced to a point where it is no problem at all.

STANDARD

STANDARD OIL COMPANY *(Indiana)*

A complete line of metalworking products including: STANICUT Cutting Oils—Special duty cutting oils with correct proportions of extreme-pressure and friction-reducing ingredients. STANOSTAMP Compounds—Three established products for stamping or heavy drawing operations on either low-carbon or alloy steels. SUPERLA Quenching Oil—For quenching work on systems where cooling facilities are limited and bath temperatures are high; efficient quenchings of large forgings.



MACHINES USED by The Hoover Company include National Acme and New Britain six-spindle automatics and single-spindle Brown & Sharpes. All run generally at maximum speeds and feeds. Metals worked are C1212 and C1213 steel, brass and aluminum. *Texaco Cleartex Oil* is used exclusively — as cutting fluid and machine lubricant.

HOOVER VACUUM CLEANER PARTS MACHINED WITH TEXACO...

THE HOOVER COMPANY, North Canton, Ohio, has for the past eight years been machining all parts for the famous Hoover Vacuum Cleaner and Hoover Steam or Dry Irons with *Texaco Cleartex Oil*—a dual-purpose oil used as both cutting coolant and machine lubricant. Results have been outstanding.

Texaco Cleartex Oil gives Hoover excellent tool life and fine finish on machined parts. In addition, it keeps the lubricated parts of the automatics exceptionally clean. Consistently low machine maintenance costs are reported.

Texaco Cleartex Oil is just one of the complete line of *Texaco Cutting, Grinding, Soluble and Hydraulic Oils*—all designed to help you do all your machining better, faster and at lower cost.

Let a Texaco Lubrication Engineer specializing in machining help you gain these benefits. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

Gaging Metalworking . . .

PRODUCTION INDEX
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	AUG '54(*)	JULY '54(p)	JUNE '54(r)	JULY '53
Tot. Index...	**148**	**150**	**146**	**171**
Machinery	126	123	145	
Electrical Machinery	185	173	200	
Autos	95	102	131	
Other Transportation	299	284	310	
Other Metalworking	126	125	146	

(*) Estimated (p) preliminary (r) revised

General pickup in metalworking should start soon. Things have gone along more or less in neutral gear during the summer months — with some industries a little better off than expected — and some a little worse off.

The steelmaking picture, for instance, hasn't changed much in recent weeks — with operations generally idling along at anywhere from 55-60% of capacity.

• • •

Steel warehousemen, on the other hand, are breathing a distinct sight of relief — they expected the bottom to drop out of their business in July and August. It didn't.

Nationwide steel warehouse shipments in July and August were only about 5% lower than June levels. But it was the Southern and Pacific Coast warehouses that kept the flag flying.

Eastern and Midwestern steel warehousers' business was down as much as 45% in the first half.

Steel warehouse receipts from mills stayed level with April and May, with stainless and tool steel orders holding well above all other items except structural steel.

Warehousers have been busy getting their inventories under control. Now they are turning over their stocks at a twice-a-year rate. Back in January, their turnover was only one-and-a-half times a year.

• • •

The screw-machine products business is in the doldrums. It hit an all-time low in July.

This surprised nobody. Screw machine products people predicted the slump 'way back at the beginning of the year.

They also predicted that volume will start to pick up this month, and will gather momentum into the late fall and winter months.

In all, screw machine volume was off about 43% for the first six months of 1954 as against the same period in 1953. Year-ago forecasts predicted a 37-40% decrease.

Despite the anticipated pickup through the next six months or so, industry officials think the upswing will be only temporary until the fall of 1955.

• • •

Auto output, too, may hit a new low sometime this month. September and October are the shutdown months for the Big Two — Ford and GM. Consequently, you can look for an output of only 250,000-300,000 units in September. But yearly output will still be in the neighborhood of 5.2-million passenger cars and 1-million trucks — that is, if all the new models come rolling off the lines in November and December, as scheduled.

• • •

Auto parts makers are feeling the pinch of slowed-down car output because of model changeovers.

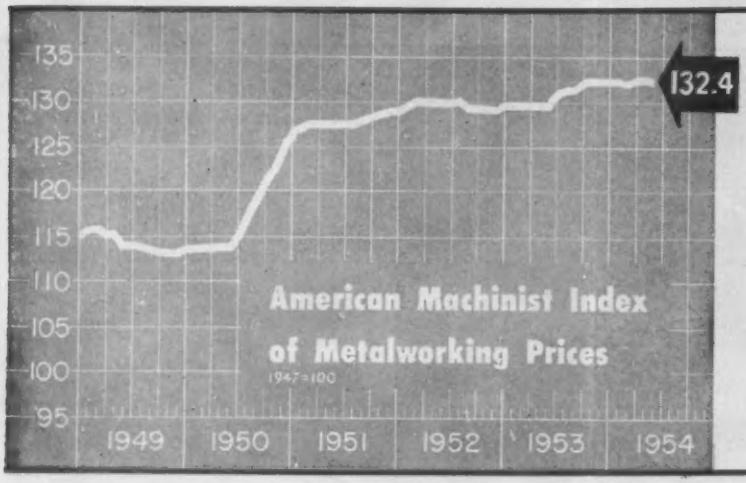
One parts maker, who has a pretty fair volume of orders from car makers on his books, is furloughing his production workers. The reason: he can't get the orders released yet.

Aviation parts makers, however, are operating on normal schedules.

• • •

Cutting tool demand is strong, with the market showing an increase in orders from varied metalworking industries — particularly aviation and automotive firms. This represents a very definite upswing from the industry's July low point.

Gaging Business . . .



PRICE INDEX

	AUG '54(*)	JULY '54(p)	JUNE '54(r)	JULY '53
Total Index	**132.4**	**132.4**	**132.5**	**131.5**
Metalworking Machinery	**141.6**	**141.6**	**140.8**	
Other Machinery exc. Electrical	**137.4**	**137.5**	**135.9**	
Electrical Machinery	**131.1**	**131.1**	**129.9**	
Fabricated Metal Products	**128.7**	**128.7**	**128.2**	

(*) Estimated (p) preliminary (r) revised

Everything seemed to drop off just a little in July. For instance, after seasonal adjustment, manufacturers' new orders ran $300 million under the June figure for a $21.9 billion total.

July manufacturers' unfilled orders, too, declined $500 million from June's $48.9 million. And this figure was $24.3 billion under unfilled orders for July 1953.

• • •

A few business bellwethers held steady through the June-July period.

Manufacturers' shipments, for instance, after seasonal adjustment in July held just about level with June at $22.4 billion.

But this was still $2.3 billion under July '53.

And personal income stayed the same as for June — at an annual level of $286.5 billion.

This was considerably under July 1953's all-time peak rate. And manufacturers' payrolls showed a sharp decline from June levels — mostly attributable to (1) rubber and lumber labor disputes, (2) a cut in auto employment.

But there were a couple of July bright spots, too. For one thing, manufacturers continued to pare their inventories — cutting them down $500 million in July.

At July's end, manufacturerers' inventories stood at $44.2 billion — $2.2 billion less than in the comparable period in 1953.

• • •

Farm prices rose about 1.5% after two successive months of decline — but farm price levels were still about 1.5% under last July's and about 18% under the all-time peak recorded in February 1951.

This upswing in farm prices may be felt soon over your grocery counter.

• • •

The cost of living index has been relatively stable all through the year. The indexes for January and July were the same (115.2% of the 1947-1949 average).

The January-and-June figure is about 0.5% above this year's low point — April.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	123.5	123.2	134.3
Steel ingot operations (thousands of tons)	1,544	1,515	2,040
Electric power output (million Kilowatt hours)	9,227	9,207	8,540
Production of automobiles and trucks	113,169	121,736	152,866
Engineering construction awards (*Eng. News-Record*—millions)	$376.7	$224.2	$273.5

QUARTERLY BUSINESS INDICATORS

	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)	$356.0	$355.8	$369.9
Expenditures of new plant and equipment (millions)	$ 26.79	$ 26.94	$ 28.48
Profits after taxes in primary iron and steel industry (millions)	$167	$205	$228
Profits after taxes electrical machinery industry (millions)	$173	$163	$194
Profits after taxes machinery (except electrical) (millions)	$229	$184	$262
Profits after taxes in motor vehicles and parts industry (millions)	$291	$233	$269
Motors and generators new orders index (1947-1949 = 100)	152.0	144.6	156.2

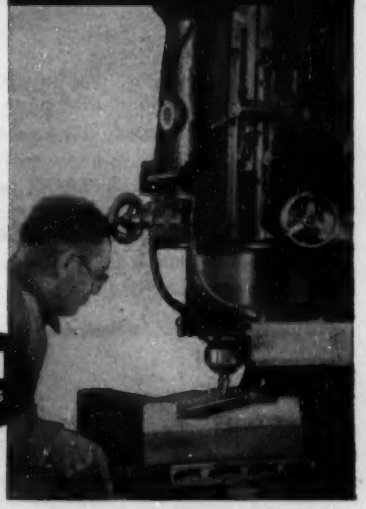
* Seasonally adjusted

T-J toughness

means more work between grinds...

LOWER DIE COSTS!

This T-J Cutter at work on a connecting-rod die block for a board drop hammer. Material being milled is "Hardtem" die steel. A cutter of right design and heat treatment for this high speed work in tough die steels, making possible maximum efficiency of these machines.



LARGEST SELLING CUTTERS FOR TOUGH DIE STEEL

Be sure of *top performance* in die sinking milling cutters . . . specify T-J! They're preferred everywhere today in die and forge shops . . . because T-J Cutters are *extra sturdy* . . . you can raise the feed!

Designed for speed, accuracy and long life . . . hold a sharp edge longer on job after job . . . less breakage! Made from an extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Wide range of styles and sizes to *reduce your* die costs. Send for new catalog 4-153. The Tomkins-Johnson Co., Jackson, Mich.

FOR TOUGH JOBS SPECIFY

T-J TOMKINS-JOHNSON

RIVETORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

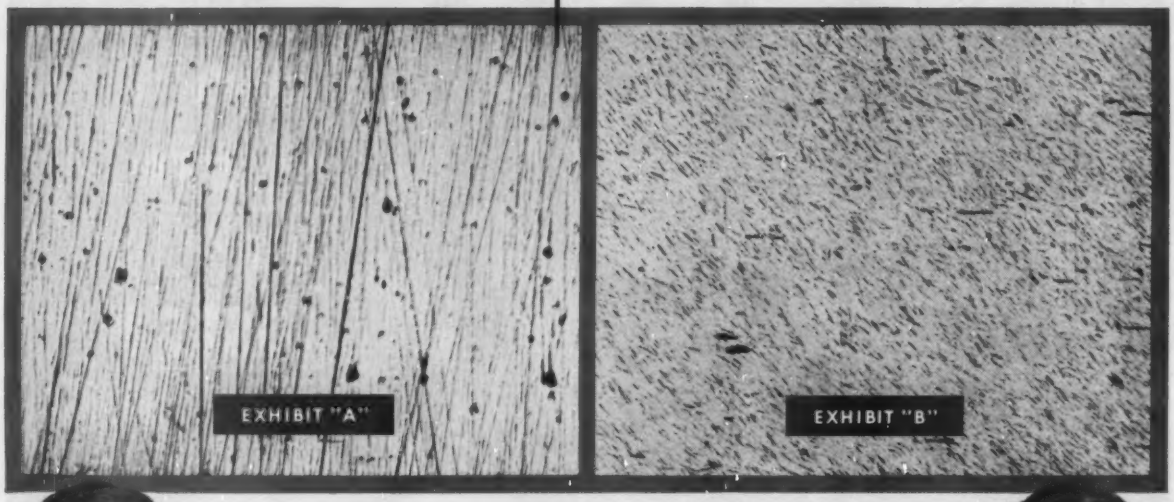
38 YEARS EXPERIENCE

LITTLE KNOWN FACTS

about the NATURE of GAGES

Scientific research has brought to light facts about *Fixed Size Gages* that will benefit all of us who come into close contact with them—especially those who pay good money for them.

The two illustrations "Exhibit A" and "Exhibit B" are unretouched photomicrographs of lapped gage surfaces straight from The Detroit Testing Laboratory, Magnification X100 in both cases—Project 4726-C-12.



COMPLEXION—Harsh or Lovely

Notice the deep lines and wrinkles that characterize "Exhibit A." A definite indication of improper "Skin-Care."

Contrast that with the smooth even texture and youthful appearance of "Exhibit B." A skin that invites your touch.

Both gages are the same age and neither had ever been used at the time they were photographed. No favoritism whatever.

CONCLUSION

The ridges between the furrows in "A" will wear down quickly when that gage is put into service. Result: Rapid initial wear—Short accurate life—High cost per part gaged.

"B" is a SHEFFIELD GAGE, painstakingly finished by Master Craftsmen using an exclusive Sheffield lapping process.

It is perfectly obvious that the Sheffield Gage will have a longer, accurate life and lower cost per piece gaged.

Gage Division—The Sheffield Corporation
Dayton 1, Ohio, U.S.A.

Something to Think About!

6808

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Automation Is Only the First Step

Automation is a trick word that can be, and often is misleading. It is not synonymous with the automatic factory. In its uncorrupted form, it means the loading, work treatment and unloading of a part by mechanical devices and the automatic carrying of the work from one operation to the next. Nothing more than that.

If one keeps this definition in mind, automation can be applied in almost any kind or size of shop. It is not the exclusive property of a Ford or General Motors or General Electric.

Automation is only the first step leading ultimately to an automatic factory. There are several intermediate steps, as David Smith, manager of research of the Jones & Lamson Machine Co, points out.

The second step is to inspect the work continuously and automatically in order to control or regulate the machine to correct any variation from the desired norm.

Machines already have built-in inspection devices to signal an error in tolerance or size, to remove the work when a desired dimension is reached, and to stop the machine when a dimension goes out of tolerance.

Very soon, machine tools will be equipped with devices that go so far as to make a correction without stopping — a correction that will compensate for tool or wheel wear and even will decide whether a change should be made when a variation occurs.

The third step is to develop a system for putting control information into a machine, either from outside data or from operations of the machine itself. Tape and punch-card control are in this category. A formula can be converted into a work-piece without a drawing first. For lack of another name, this might be called "systems engineering."

The fourth step has to do with handling data. There is too much paper work, and hence too much overhead, in production. Paper work must be mechanized.

Think of the production man, if you please, carrying a badge with identifying letters, projections, or what have you. He can punch a time clock with it, thus signaling a central record that he is at work. He can carry a second badge, for the job, which will notify central records that he is working on that particular job. No timekeepers and no departmental production control. A central robot and memory system absorbs all the data and feeds back whatever information is needed at any one time. This system, together with automatic calculating equipment, makes it possible to get up-to-the-minute costs on any job.

The fifth step might be termed "mechanized management." Much conference and paperwork time can be eliminated. Management will be able to devote its energies to detection and correction of errors, to development and to improvement. Records, automatically controlled, will be available instantly and constantly on anything and everything. The body will still be breathing instead of being three days dead when management arrives on the scene of a business accident.

We have a long way to go before the automatic factory, from management on down, is achieved. Automation is only the beginning and at best is but a small part of it. Let us recognize automation for what it really is and treat it as such. If we will do that, we will soon be farther ahead in our laudable desire to mechanize metalworking production as rapidly as possible.

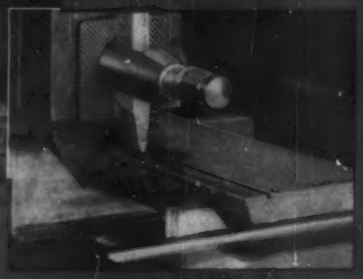
Burnham Finney

Form Tools

Dies from Templates

Facing 90° shoulders

Duplicating 4 Cams



Interchangeable molds

Automatic duplicating of MANY shapes on a Cincinnati Shaper . . .

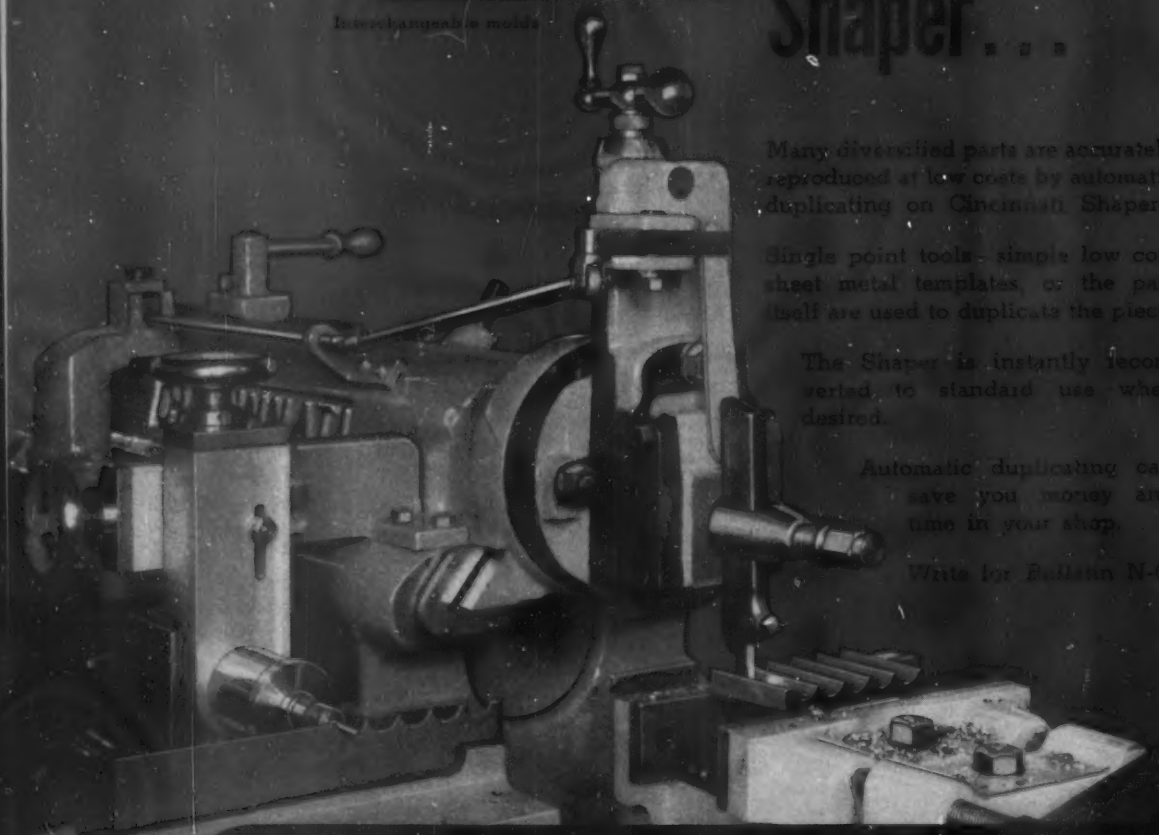
Many diversified parts are accurately reproduced at low costs by automatic duplicating on Cincinnati Shapers.

Single point tools - simple low cost sheet metal templates or the part itself are used to duplicate the piece.

The Shaper is instantly reconverted to standard use when desired.

Automatic duplicating can save you money and time in your shop.

Write for Bulletin N-6

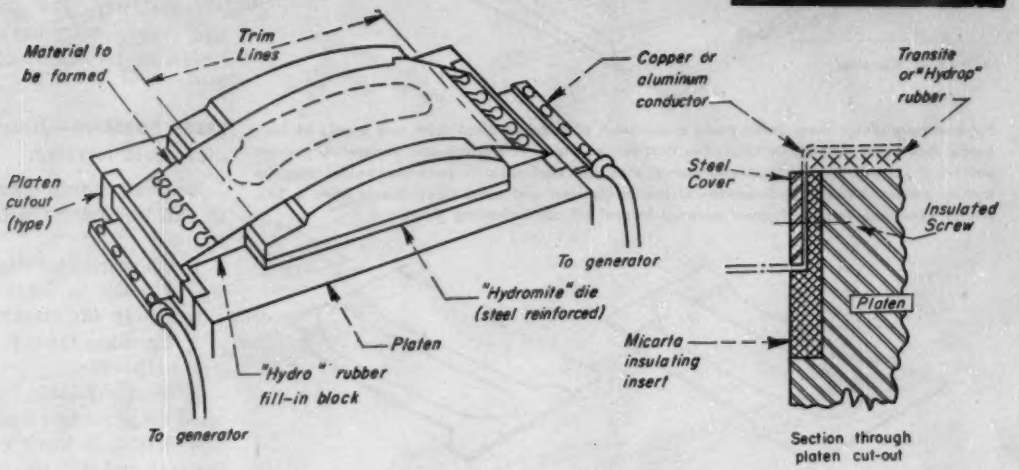


THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

American Machinist



Setup for rubber forming. Stretch flanges should be kept to same limits as normally used for cold sheet-metal fabrication, because upon being heated titanium becomes increasingly susceptible to local necking

Shop hints help form and mill titanium

Data pertinent to designing and planning for production are digested here from Republic's Ti "bible." This information has been evaluated and compiled from shop records since 1950, and now represents best known, tried, and proven techniques that this team can find

SPAR MILLING AND MFG RESEARCH DEPTS, REPUBLIC AVIATION CORP, FARMINGDALE, NY

HEAT-TREATING

Titanium can not be heat-treated to increase hardness or strength in the normal sense. It can, rather, be embrittled by gaseous (oxygen and nitrogen) contamination when heated in air to temperatures above 1050F—the severity being dependent upon the degree of and time at temperature.

COLD WORKING

A stress relief is required for nearly all formed parts and consists of soaking at 900 to 1000F for 30 min. followed by air cooling. It is desirable to avoid severe deformation requirements which would necessitate a full anneal at 1250 to 1300F in an inert atmosphere with furnace cooling to 1050F followed by air cooling.

Some information and four illustrations courtesy "Aviation Week," Apr 12 '54

MINIMUM BEND RADII—*Cold*

Sheet Gage	Comm Pure Alloy	(8% Mn) Alloy
0.064 in. and under	3T	4T
0.072–0.125 in.	4T	5T
Hot—950°F		
0.064 in. and under	2T	3T
0.072–0.125 in.	3T	4T

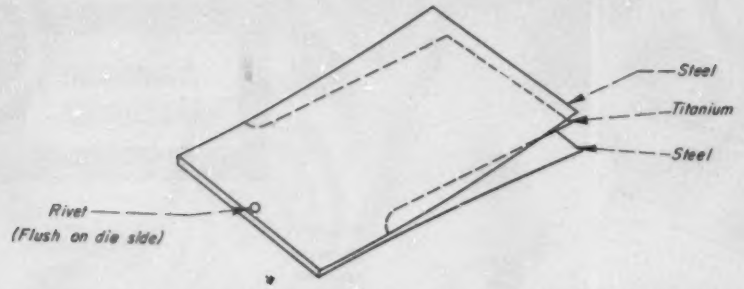
Note: Because of material inconsistencies, one or two failures should not be considered as sufficient cause for the elimination of a particular operation.

Care must be taken to eliminate notches and scratches which can cause cracking while working material. In the initial proving of all operations, a rigid inspection under a microscope for cracks, severe scoring and notches is advised.

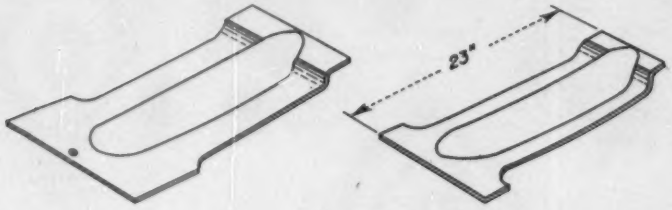
RUBBER FORMING—*Cold*

Where practical, bend line should be specified as being between normal and 45° to direction of rolling (grain).

Please turn page



For a comparatively deep draw, make a sandwich of titanium blank with two blanks of low-grade steel 0.025 to 0.050 in. thick. The steel retains the heat and provides support to prevent wrinkling. For short production runs, cost of scrapped steel sheet is more economical than the tooling otherwise required. Sandwich of low-grade steel and press block should have a 1-in. border extending beyond formed material to seal off contaminating gases.



Titanium Part Sandwich Formed

Where heat is used, it is often possible to design improved configurations which would not be considered practical for cold forming. Note bead extension over joggle area.

Longeron 0.102 in. thick was hot-formed on 75-ton brake. Cold forming would require job to be done on 200-ton brake

FLANGES:

1. In 0.025 to 0.050-in. thick stock, small segments of shrink flanges (up to 12 in. long), having a convex radius of 25 in. or more can be formed cold but will require a slight amount of hand refining.

2. Shrink flange heights should be limited to 0.75 in.

3. Stretch flanges should be limited to approx 7% elongation.

4. Average straight bend springback allowance for a 90° bend on a 3T tool is approx 7°.

RUBBER FORMING—*Hot—techniques for non-severe deformation of material.*

1. Press blocks for intricate shapes—Kirksite or Meehanite with 1° springback allowance and then proved out in the shop.

2. For a radical shrink flange, a preform block may be necessary.

3. Male shrink reliefs can be used to best advantage. Hand finishing, using torch heat may be employed, but must be done with adequate care to avoid overheating, and "on the job" inspection should be provided.

4. Press block to have quick blank locating facilities for rapid transfer of parts from the furnace to block.

5. Forming temperatures should be held between 700 to 750F max. to prolong life of rubber and to avoid contamination to material caused by gaseous vapors formed between rubber and material. Use of glass cloth between material and rubber will prevent contamination and further prolong life of rubber block.

6. Material 0.064 in. thick and under need not be preheated as heated press blocks are sufficient for successful forming.

7. Caution: For deep drawing and severe deformation of Ti use sandwich technique for hot forming.

PRESS FORMING—*Male and female dies—cold forming.*

Because titanium has a tendency to gall the dies, it is recommended that:

1. Clearance be slightly greater, up to 0.005 to 0.010 in. in some cases, than for stainless steel.

2. Forming faces to be hardened and polished.

3. Best available lubricant to be used on parts and die surfaces.

4. Blank to have grain between normal and 45° to line of bend.

FORMING RESISTANCE-HEATED MATERIAL

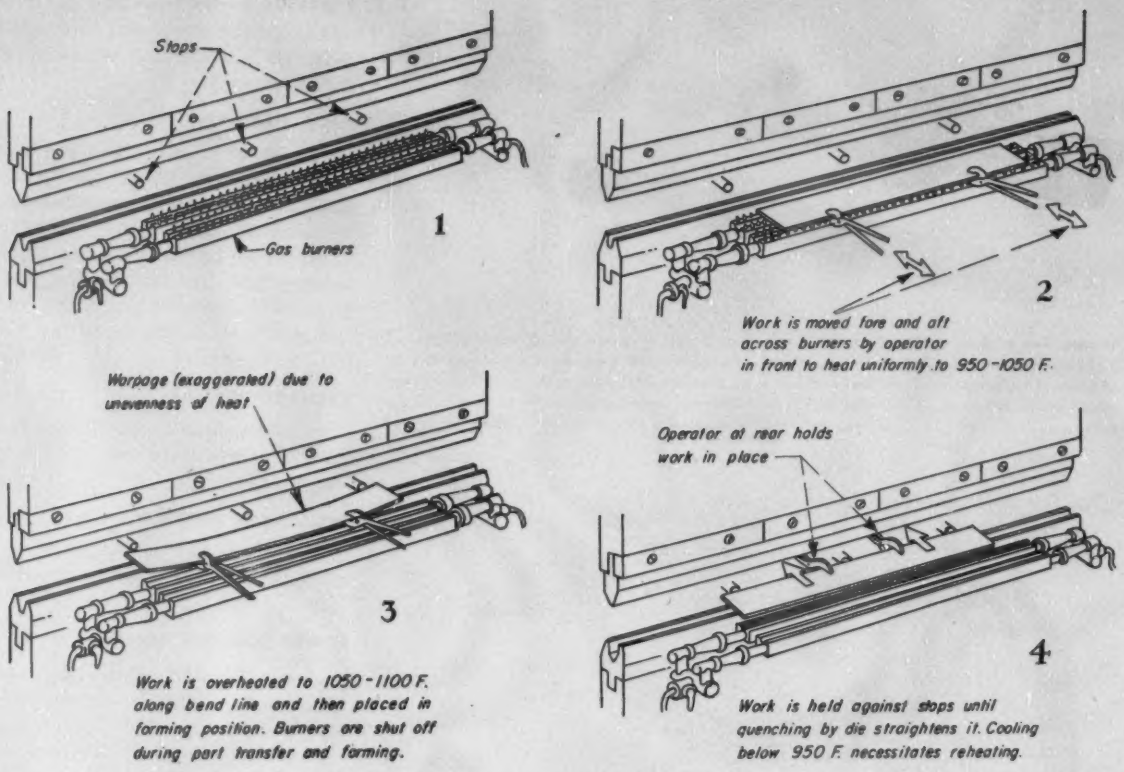
Most satisfactory method would be the use of non-conductive, high temperature-resistant material for press dies so heating circuit may remain closed during forming cycle. With proper pyrometric correlation between press control and part temperature, it would then be possible to maintain the correct temperature of 950 to 1050F throughout forming cycle. However with steel dies, excellent results are obtained with rapid forming cycle.

STRETCH PRESS—*Cold stretching.*

1. Progressive stretching of skins, with an interstage stress relief between successive operations, has been found successful. Total stretch should not exceed 10%. With full anneal between operations, greater deformation can be performed.

2. Parts having irregular contour should be split so that regions of high strain with a straight or gradual intermediate contour are avoided.

3. Where it is impossible in design to avoid regions of high strain, proper use of localized torch heating will guard against necking. The heat should be applied to inner


Stops
Gas burners
1
2
Work is moved fore and aft across burners by operator in front to heat uniformly to 950-1050 F.
Warpage (exaggerated) due to unevenness of heat
3
Work is overheated to 1050-1100 F. along bend line and then placed in forming position. Burners are shut off during part transfer and forming.
Operator at rear holds work in place
4
Work is held against stops until quenching by die straightens it. Cooling below 950 F. necessitates reheating.

Setup and procedure for hot forming on power brake. For temperature indication, Tempilaq, which melts at the desired temperature, is painted on material in various spots prior to heating

portion at that point which offers greater resistance to bending of high-strain region.

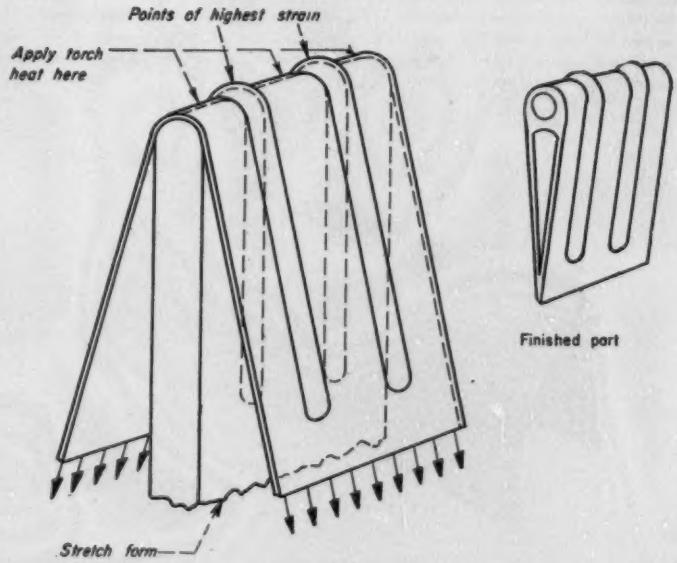
BRAKE FORMING—*Power brake—hot.*

1. The use of heat in brake bending of titanium serves to reduce both the minimum allowable bend radius and power requirements. As an example: titanium 0.012 in. thick, 50 in. long (RC-130 A), was bent on a small 75-ton power brake.

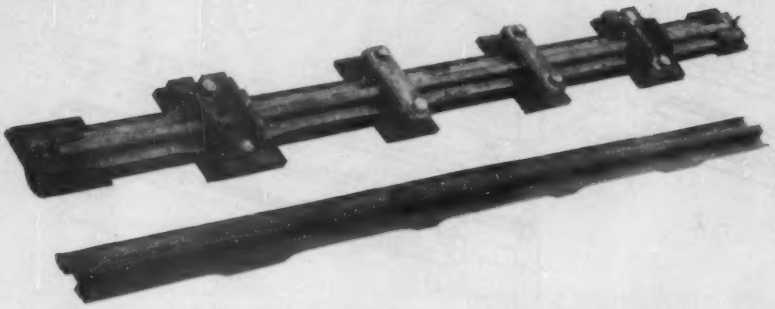
2. Several practical methods of heating the material are the furnace, platen or induction, and the following process which has proved more flexible than any of the others:

Two 58-in. long, 1-in.-dia pipe gas burners are mounted on adjustable brackets immediately in front of the brake, on a level with the bottom brake die.

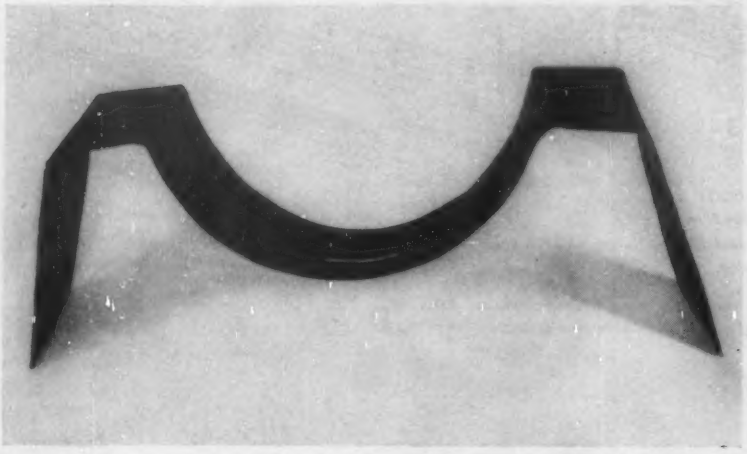
The material is moved back and forth over the flame until it reaches approx 950 to 1050F, then overheated along bend lines to approx



Stretching part with high strain points, and preformed heads. Desired configuration is produced by shrinking of heated portion and bending primarily in the normally high stretch region. Care must be taken to avoid heating above 1200 F



Stringer has edge areas flattened hot. Fixture holds part to shape during stress-relieving. Ti 0.072 in. thick was hot-formed on power brake equipped with a gas burner mounted in front of brake. This setup could be replaced for large production runs with an electrically heated platen which would bring material to 900 to 1000F for immediate transfer to brake. Springback, approx 3° to 5°, was removed by stress-relieving in a fixture at about 1000F for 20 min.



Shroud segment, hot-formed in hammer, had heating electrodes attached to trim material. Trim may be shortened by boosting power for resistance heating of part. Rough preformed to shape and heated to 950 by electrical resistance, using standard dc motor-generator welding set (600 amp, low voltage). Hammer is maintained in closed position for ½ to 1 min. to insure uniform cooling. This procedure minimizes springback

Hot-forming generally is being used for RC-130A sheet. Increased elongation of this material at high temperatures makes forming easier. Hot-forming also minimizes effects of material inconsistencies, yielding a more efficient structure weightwise because of smaller bend radii which can be obtained

1100F. It is positioned for bending against three stops and held until material is straight, at which point it is formed.

DROP HAMMER—*Hot*

1. Meehanite is the best die material for production quantities. Lead punches and Kirksite dies can be used for short runs.

Parts can be started using high-temperature-resistant rubber pads to prevent excessive wrinkling, and temperatures should be in the 950 to 1150F range.

FURNACE HEATING

Recommended for work that can be transferred from the furnace to the die rapidly.

RESISTANCE HEATING

Where work configuration is suitable, this is the most satisfactory method.

POWER-CONTOUR ROLLING

Cold titanium sheet can be cold-contour-rolled to approximately 9 or 10% deformation. Interstage annealing for 30 min. at 1000 F is recommended if more than 7% material deformation is required.

1. When the configuration is other than straight, or the cross-section of the blank varies, the speed of the heating cycle should be retarded to avoid hot spots and maintain greater uniformity of temperature.

2. For electrode contact, blank should have at least a 1- or 2-in. trim allowance on its longest axis.

MILLING

Latest milling data obtained from the machining of titanium RC-130B has resulted in the following tips:

1. Rigid work clamping is a must to avoid creeping and flexing of part.

2. Rough parts all over, then finish-mill least critical dimensions, finally finish most critical dimensions in order of importance.

3. After roughing all over, fill all cavities and openings with "Cerro True." (This material was found to have the least shrinkage factor.)

4. Climb milling gives best cutter life and surface finish.

5. Where possible when roughing at low speeds, chamfer corners of milling cutters and blend chamfer into straight cutting edges with slight radius. Nose radii should be sharp for high speeds.

6. Add chip breakers to periphery of end mills.

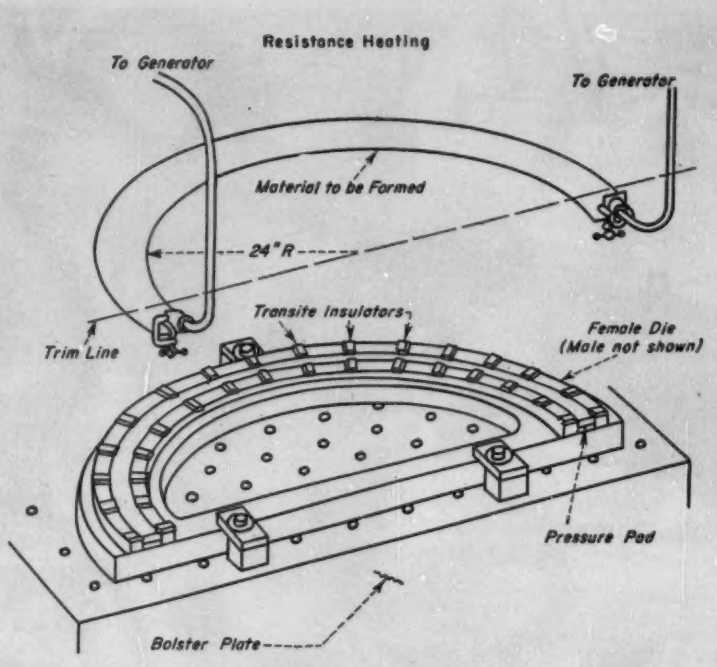
7. Best cutting speeds for longer tool life and productivity range from 35 to 55 sfpm with feeds of 1⅛ ipm.

8. Consistent results were obtained with HSS cutters running at 40-50 sfpm with chip loads of 0.003 to 0.005 in.

9. Sulfur-base water-soluble oil proved to be most satisfactory as a coolant (which was found mandatory).

10. Top and side rake angles from 6 to 8° positive.

11. Carbide shell mills produced varying results due apparently to greater sensitivity to variations in rigidity of setup and speeds. To date best results with tool life and finish were obtained with speeds of 40 sfpm or less, chip loads of 0.007 to 0.010 ipt, and rake angles of 0° top, 5° to 10° side and back.



Set-Up for Male and Female Die Forming

Setup for male and female die forming. Blank cross-section should be as nearly uniform as possible, allowable variation being about 10%. Cutouts should be made after forming. With this setup, formers 0.040 in. thick were brought to 1000 to 1100F by resistance heating (350 amp, low voltage), and were hot formed. Heating cycle was about 20 sec

THE TRANSISTOR AND MACHINE TOOLS

Why has the transistor not replaced vacuum tubes as much as predicted? Why is the transistor important to machine-tool controls? Where and how can it be applied successfully—right now? . . . Answers to these questions are given in a technical paper by Dr R L Bright, Westinghouse Electric Corp, at the 18th Annual Machine Tool Electrification Forum.

First, transistors have not replaced vacuum tubes greatly because they are not equivalent to tubes; they cannot be made direct replacements in most cases. One reason is that while a vacuum tube draws almost no power from the signal source, the transistor draws a little, and that small amount may be important. Another is that tubes perform well over large temperature ranges, but transistors are temperature-sensitive. Most tube circuits now existent take advantage of the characteristics of tubes, but not of transistors. One future problem, then, is to design circuits that will do work by taking advantage of the characteristics of transistors, not tubes.

One advantage of a transistor is the ability to control power flow with an efficiency of 98 or 99%. Coupled with the transistor's reliability, this seems to indicate applications in the power-control field—and probably within 2 or 3 years.

Transistors capable of controlling several kilowatts of power should be available in a year or two. A transistor operated at the ends of the load line and switched very rapidly acts much like a relay, and such a transistor (type now available) can control a power load equal to 50 times its rated dissipation.

The trick is in controlling the operating conditions so voltage vs current are at the right values to allow top transistor performance—either high-current, low-voltage, or high-voltage, low-current.

APPLICATIONS

Two switching transistors can be wired to make a square-wave amplifier that might be used as part of a tape control for a machine tool.

Transistors can be wired to pass alternating current and block alternating voltages, and doing this they might be used to replace contactors in induction-motor starters. With proper circuits, a transistor can replace a thyratron in high-current, low-voltage switching applications.

Life tests show that transistors should last as long as tubes, even though early models often failed because of mechanical faults and moisture content. These defects have largely been eliminated, and there is now no known factor that could place an upper limit on transistor life as long as the unit is operated within its ratings.

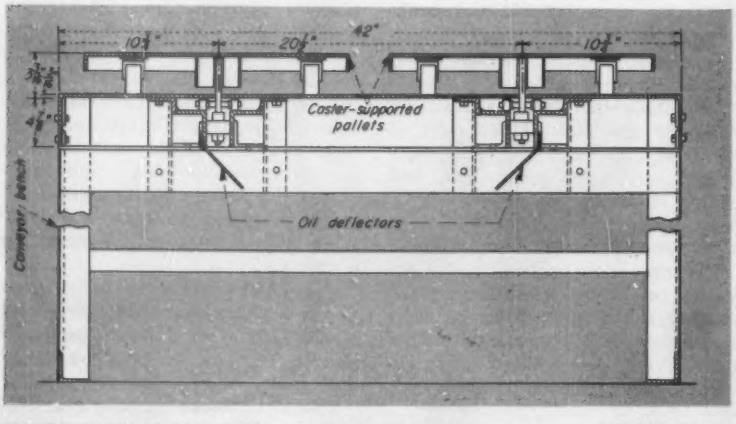
Germanium transistors will switch up to a temperature of 100C, and silicon transistors will soon be available and appear to be good up to 200C.

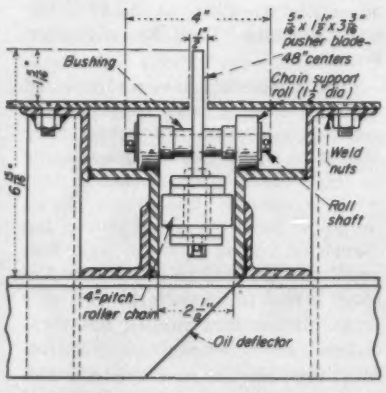
Phototransistors are fully practical today, and operate more sensitively than photo tubes and with less circuitry. They may be applied to the machine-tool field any time.

EACH of the two 42-in.-wide, 36-in.-high, steel conveyers is about 235 ft long, extends 216 ft into the shop. Conveyors, driven by 2 hp motors, travel 57½ fpm, taking 8 min for circuit of 460 ft chain loop. Machines and benches are located along either side of conveyors. For convenience, one conveyor carries castings (iron, magnesium, and aluminum); the other line carries steel parts

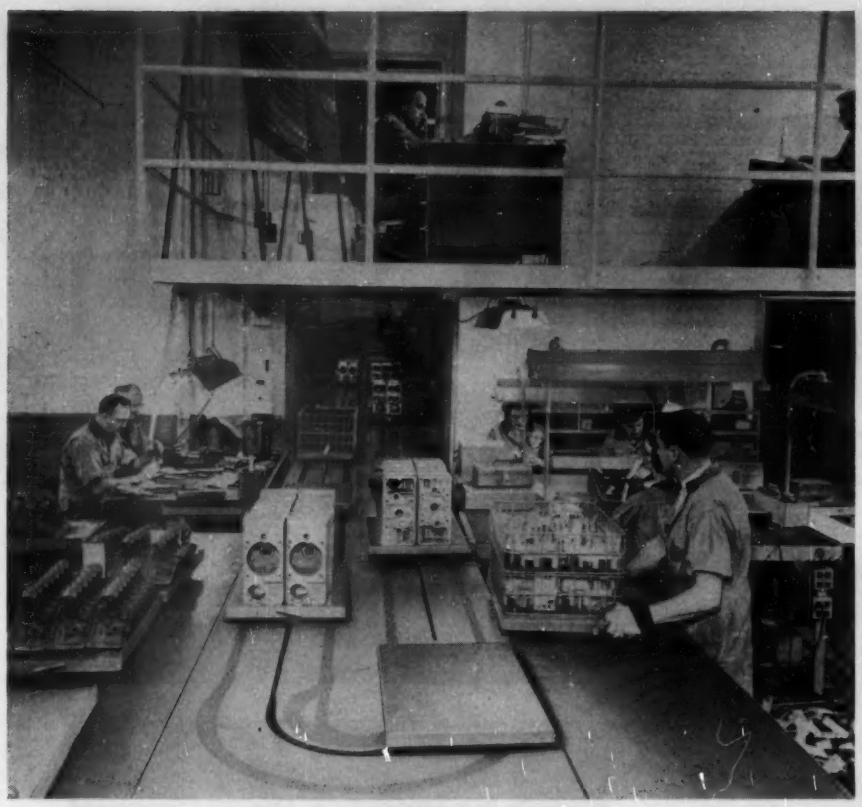
Conveyors and telephones speed schedules

WARD A RING, vice president, WOODWARD GOVERNOR CO, ROCKFORD, ILL

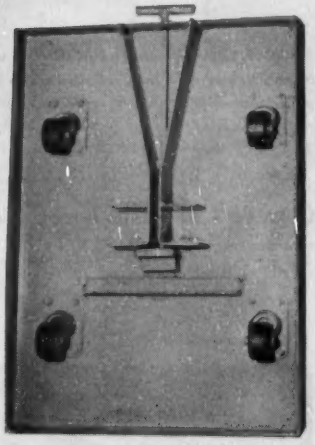




CROSS-SECTION OF CONVEYOR and conveyor bench shows how pusher blades (4 ft apart) project through bench top to engage pallets. 16-tooth drive-sprockets and takeup sprockets at the ends of each conveyor have 20½-in. PD. Bus ducts within bench carry electric power, compressed air (conventional and specially dried), and high-pressure hydraulic oil to machines where needed. At floor level within bench is exhaust air duct with connections to certain machines



CONVEYOR extends 19 ft into stockroom where pallets are loaded and unloaded. Line manager can be seen in his glass-enclosed office overlooking his entire work area. Conveyors developed by Conveyor Systems, Inc, in cooperation with Woodward engineers



WELDED STEEL PALLET 17 x 24-in. rides on four swivel casters. Turn of handle on end of pallet disengages quick-acting lock, permits removal of pallet from conveyor

Mass-production economies are being approached by conveyor-delivery of small job lots to machines. Carefully planned schedules are kept up-to-date by in-plant telephone

Two novel bench-high drag-chain conveyors installed in the machine shop of Woodward Governor's plant in Rockford have allowed several methods improvements:

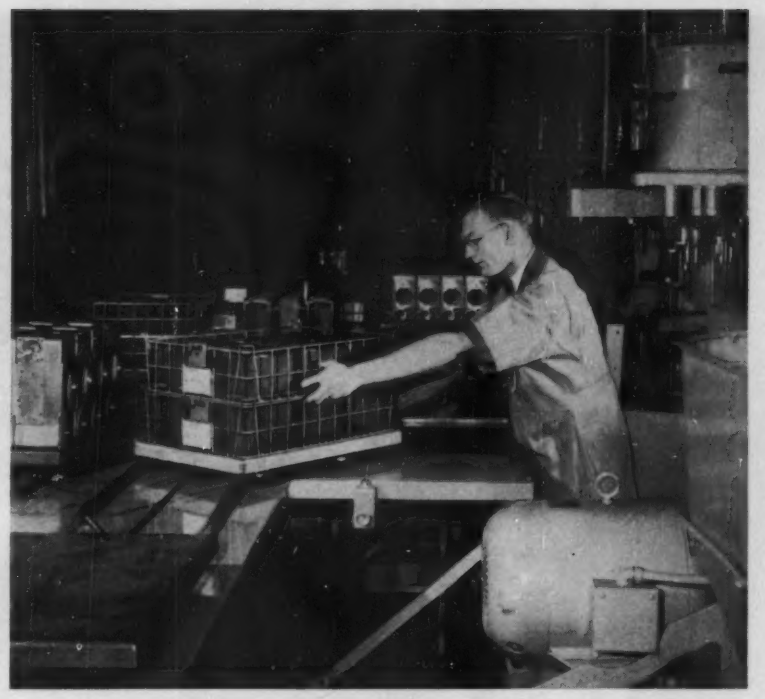
1. Trucking of parts through the shop has been eliminated, except for larger parts machined in an area not served by the two conveyors. As a result, there is much less damage to precision parts in transit between operations, and few parts are misplaced in transit.
2. Installation of the conveyors has led to rearranged machine-shop layout, making production control much simpler. Operations on similar parts are now concentrated in one of three working areas—not scattered about the shop as was the case when layout was by machine type.
3. Production-control supervisors have an up-to-the-minute record of location of every job lot of parts. Telephones have replaced stock chasing when scheduling rush jobs.
4. Work-in-process parts are not piled up on the shop floor, but are held in racks in a stockroom until needed.

Located along each conveyor bench, handy to every machine and workbench station, is a shop telephone for quick communication with the production-control "line manager' in charge of work done along that conveyor line.

The line manager is advised by telephone about ½ hr before a machine completes work on a current order. The manager then schedules the next job for that machine, ordering the work pulled from the stockroom rack, to be ready for conveyor delivery when needed. If tools will be needed for the job, he telephones the tool crib and arranges to have tools delivered to the machine.

The line manager is again contacted by telephone when the job is completed, and he checks off prepunched time cards for costing the various operations.

PHONES NEAR MACHINES and benches provide quick communication with line manager. Phones are on closed circuit, so no dialing is needed

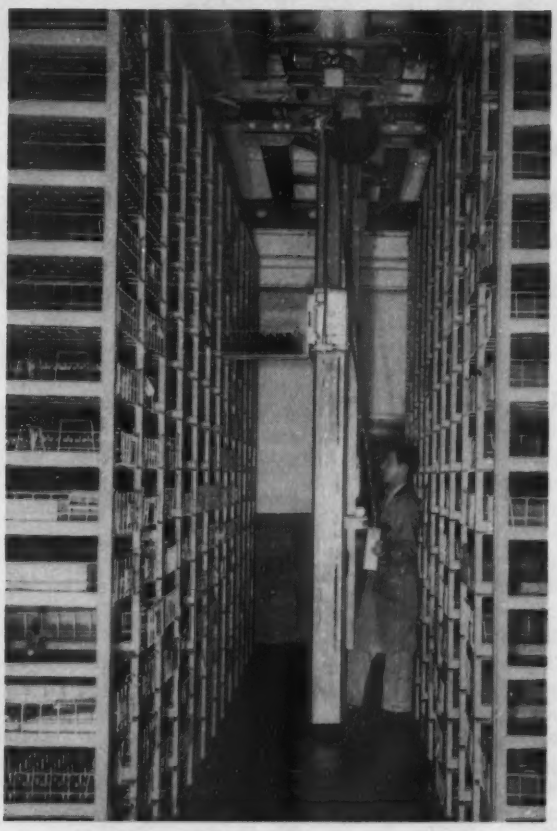


TAKEOFF SHELF AT EACH MACHINE is attached to conveyor bench, so parts can be pulled out of the way of moving pallets

Conveyors and telephones speed schedule

continued

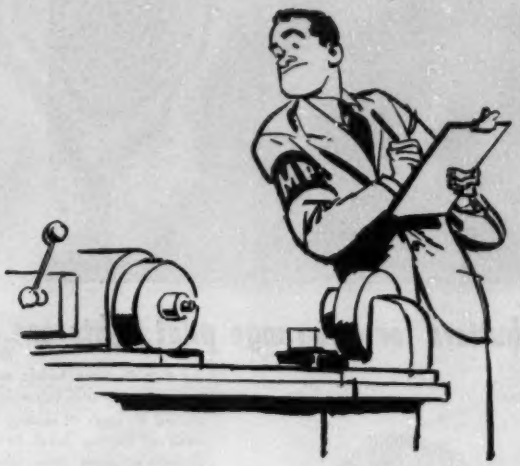
LINE MANAGERS (one to each conveyor line) can see work area, stockroom, without leaving desk. Schedule lists all jobs assigned to his group, permits quick selection of next job for each machine



PARTS WAITING IN STOCKROOM are stored in racked baskets, moved by ceiling-mounted crane

Round Table

The Whiplash



"What's the idea of strolling around the department and making notes on your pad, Ed? Are you trying to scare the men into working?"

"Well, if they can be scared into it, that's OK with me. In fact, that's the idea. I want to see if a little closer supervision will put the needle to a few of the guys who are inclined to dog it any time they can get away with it."

"Seems to me you're wasting time, just to catch a few jokers who make a habit of talking once in a while."

"That's a bad habit, Al, and I'd just as soon they talked on their own time."

"Boy, have you changed since you worked on the bench! I can remember when you muttered under your breath when old Benson used to walk around and stop, then give you the glassy stare for a few minutes. You used to get mighty uncomfortable when you had a guilty conscience."

"That's where I got the idea, Al. I figure if any of my men have guilty consciences about their work, they'll be reminded to get back to it if they see me taking things in. Besides, the shoe is on the other foot, now. I have Benson's job; and I have to keep these guys on the ball."

"They do all right, Ed. I'll grant you they goof off once in a while, but generally the boys in this shop stick to their work pretty well."

"Maybe so, Al, but it's my job to get as much work as possible out of them, and that's what I intend to do."

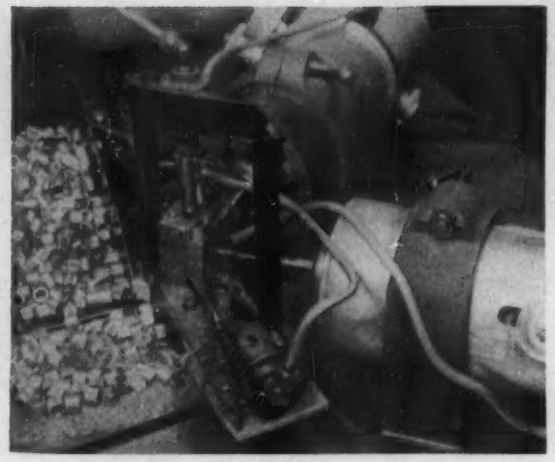
"Perhaps you could get too much, Ed. There may be a point beyond which you shouldn't go. If you irritate the men too much, they might react the way you don't want them to — by dogging it intentionally."

"Not if they see me making notes that I can save for the time when they ask for more pay, Al. This little book will help me then by giving me a better idea than I usually have of who deserves a raise."

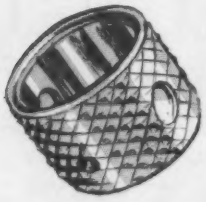
"All right, be an MP if you want to, but I'll stick to the soft touch."

"You can get too soft, Al."

***IS IT A WASTE OF TIME** for Ed to circulate among the men, making notes on their apparent energy? Will he generate more friction than increased production? Is Al more sensible in his easier approach, for today's shop workers? Your ideas on the subject may help others supervise better. Discussions of earlier topics appear on later pages.*



Air shutters for gas-range pilot lights are drilled two ways...



by two Dumore heads mounted at right angles. Fixture is a 5-stage magazine, fed at top by operator, with top-mounted air cylinder indexing parts down in succession. An ⅛-in. hole is drilled through at second level, and a 1/16-in. hole is drilled at third level. Air cylinder works slide at bottom level to eject completed parts. With holes drilled at different levels, even though at same time, vibration is slight, which reduces drill breakage—only 10% of rate on hand-fed drillpresses. Production rate is up 333%, and quality—including no burrs—is improved. Critical point: Toughest thing to teach operator on drillpress was sense of touch to prevent drill breakage. Training is now unnecessary, and two holes are drilled at once. The setup is at *Cleveland Heater Co, Cleveland,* where labor savings amount to $9000 a year.

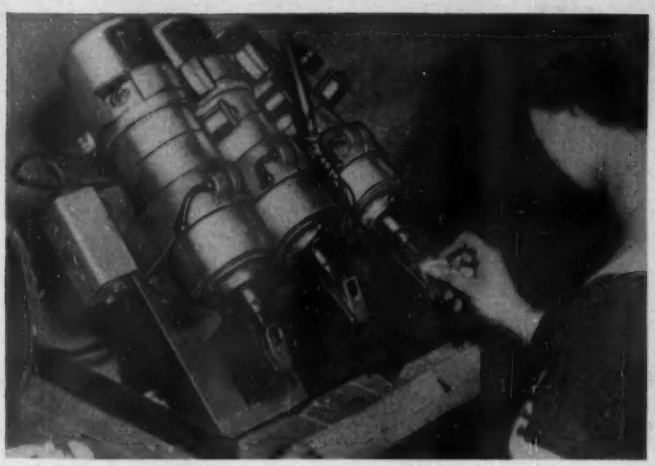
Soft touch for

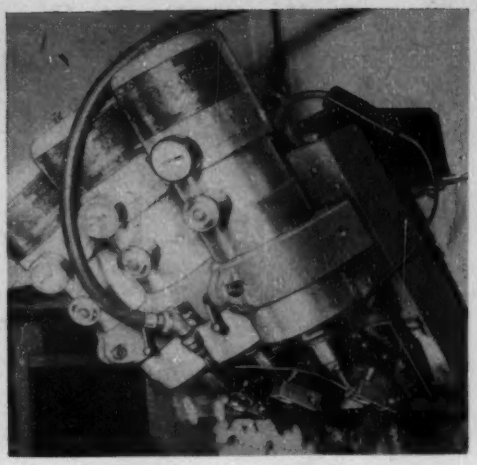
Four metalworking shops report time and money savings, and less drill breakage with automatic air-stroked, electrically controlled and powered drillheads

Units have Jacobs chucks attached to one end of armature shaft, air compressor to the other end; and motor is housed in air-cylinder piston. Soft drill action is controlled by limiting developed air pressure (up to 15 psi) and presetting stroke length (up to maximum of 1⅛ in.). Drill size and work material determine maximum reading allowable on air gage

▶ *Padded fixture...*

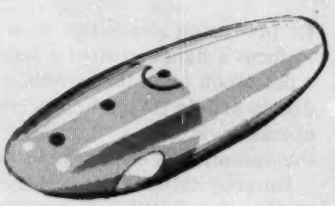
locates special pressure table under drillhead so 1300 holes can be drilled in 4 hrs. Table is sandwiched plate of 0.040-in. stainless on top, ¾-in. fir in middle, and 0.040-in. sheet steel on bottom, and was built for silk-screen printing press. No. 61 holes are spaced at 1-in. intervals. Drillhead is mounted on padded base to prevent damaging top of workpiece. *S & M Engineering Co, Racine, Wis,* used repeat-cycle timer on the job to clear chips—cycle withdraws drill at timed intervals to clear out hole.





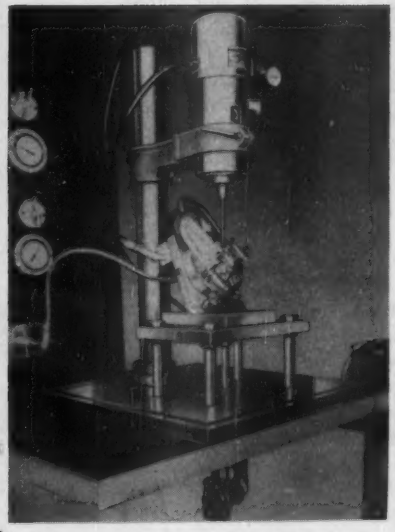
Three heads drill holes in plastic fishing-lure bodies...

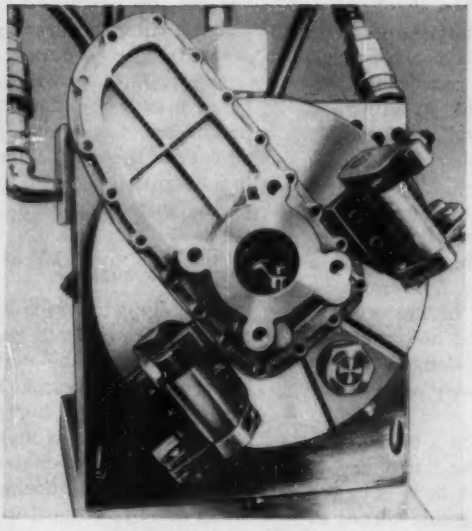
when parts are held in quick succession against positioning fixtures. Precision switches behind fixtures energize drill motions, which cannot recycle until new part is located. First two holes are 0.0456 in.; third is No. 56 with a ¼-in. counterbore, and all are at different angles. Drillhead method is 140% faster than old drillpress system with rocking fixtures, which porduced 250 pc per hr. Speed is partly due to quicker drill action, partly to fact that each part is handled only once. Important factor: Accuracy is much improved because drill units work automatically and fixtures are built to work with them. This arrangemnt is at *L & S Bait Co, Bradley, Ill.*

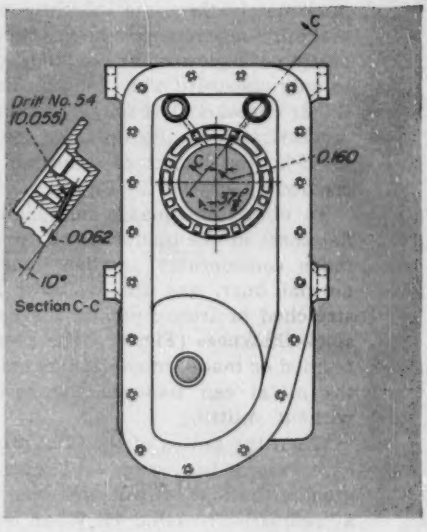


small-hole drilling

JAMES P STEIBEL,
Research & Development Director,
THE DUMORE CO, RACINE, WIS







Drillhead drillpress machines die-cast aluminum body...

for aircraft valve, drilling two No. 54 angled holes ⅝ in. deep. Setup is standard to take 15 fixtures that handle 52 different parts, and table has vertical motion, automatic clamping, and fixture indexing when necessary. Unit works automatically on about 90% of small-hole jobs taken from regular drillpress line at *Wm R Whittaker Co, Los Angeles, Calif.* Average drill breakage has been cut 95%, and drilling time about 70%. Operator training is down to about 15 min, and interest in doing job has increased. Production on the particular operation shown has jumped from 315 to 1197 units per day; which paid for equipment on first run of parts.

Cope Talks on Draw Dies ... XIX

Stampings often require burred or flanged holes

People in industry frequently ask for the formulas for a burr, and design of tools to make it. Here for the first time is an analysis of the several kinds of burrs, their formulas and maximum proportions, and the start of a series of dies to make them

STANLEY R COPE, president, ACME SCHOOL OF DIE DESIGN ENGINEERING, SOUTH BEND 1, INDIANA

In producing stampings it is frequently necessary to form a flange around a hole that has been cut in a flat blank or in the bottom or sides of a formed or drawn article. If the hole is comparatively small the operation is called "burring." If the hole is large the operation is called "hole-flanging."

Burring differs from ordinary drawing operations in that the metal is drawn from the inside of the blank, not the outside. The metal is stressed in tension and the flange must be produced entirely by stretching, thus limiting its height.

Several types of burrs are shown in Figs. 1 to 11. A normal burr, Fig. 1, is drawn from the flat sheet around an ordinary pierced hole, and has walls approximately the same thickness as the sheet. Normal burrs are limited in height because the burnished portion of a pierced hole extends for a distance equal to only one-third of its length. The remaining two-thirds (breakout) is rough and unable to withstand much stretching. By reducing the wall thickness 30 to 40%, the height of a normal burr can be increased by 40 to 60% (Fig. 2).

To obtain the maximum height of burr from a flat sheet in one operation, the pierced hole may be made considerably smaller than that used for a normal burr, and the walls of the burr may be stretched or ironed out to one-half of the original stock thickness (Fig. 3). The pierced hole must be reamed or made smooth for its entire length, so that the metal can undergo the necessary elongation without splitting.

When the radius of the fillet around a burr at the base, where the outer wall joins the flat sheet, is greater than one stock thickness, the burr is called a "radius burr" (Fig. 4). When the inside corner at the bottom of a burr is sharp, or square, the burr is called a "square burr" (Fig. 5).

Frequently it is necessary to stretch or iron out only the metal in the walls at the top of a burr to produce one having the correct inside diameter and height. Since the walls of this type of burr vary from the original stock thickness (at the bottom) to approximately 50% of the stock thickness (at the top) the outer wall is made tapered, or conical, in shape, as shown in Fig. 6.

When a burr is too high to be produced in one operation from a flat sheet, the metal must be drawn in the shape of a cup from the outside of the blank in one or more operations, and then pierced and "opened up" or burred, as shown in Figs. 7, 8, and 9.

Fig. 10 shows how the corners of non-round burrs are prepared when the height of the flange along the straight portions of the hole exceeds that which is possible to draw in the corners. The flanges along the straight portion of a hole may be of any height, but the rules for drawing round burrs must be observed at the corners.

In Fig. 11 is shown a special burr which is sometimes used when the burr must be of considerable height and it need not extend around the entire periphery of the hole. Burrs of this type may be drawn to a height equal to 20 to 25% of the mean diameter of the burr, depending upon the ductility of the metal.

HEIGHT OF BURRS

The height to which a flange may be burred from a flat surface depends upon the diameter of the burr, the ductility of the material, the condition of the hole (pierced or reamed) and the type of die used.

Flanges that are burred from plain pierced holes may be burred to a maximum height equal to 0.11 times the mean diameter (Fig. 12).

The height of a normal burr can be increased as much as 40 to 60%, if it is permissible to reduce the thickness of the burr 30 to 40%. As previously explained this type of burr is called a stretched burr. Stretched burrs are made from plain pierced holes of the same size used for normal burrs.

When the hole is made smooth through its entire length by reaming or broaching, the metal may be stretched and ironed out to one-half of its original

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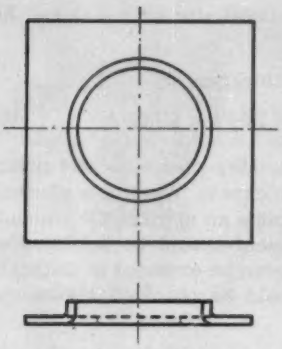


Fig. 1 - Normal burr

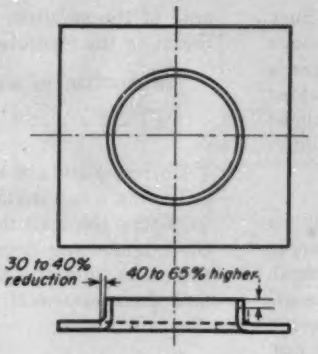


Fig. 2 - Reduced wall

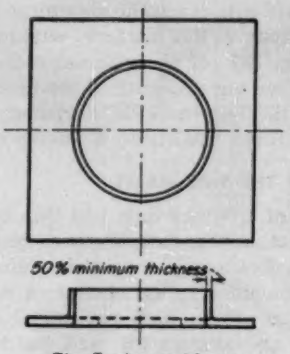


Fig. 3 - Ironed burr

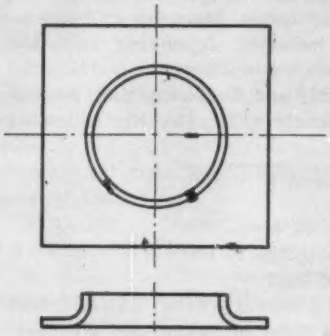


Fig. 4 - Radius burr

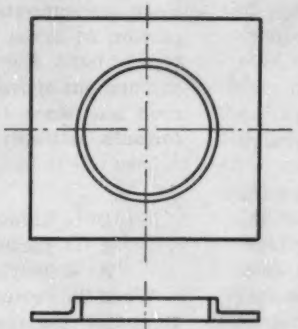


Fig. 5 - Square burr

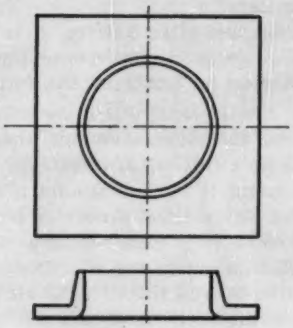


Fig. 6 - Tapered burr

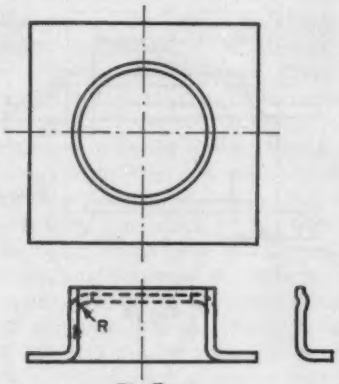


Fig. 7

Fig. 8

Pierced burrs

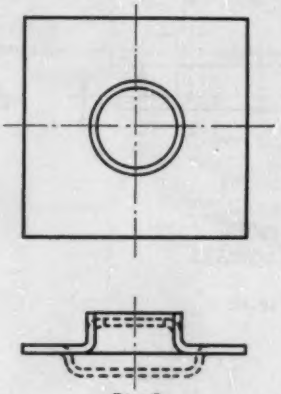


Fig. 9

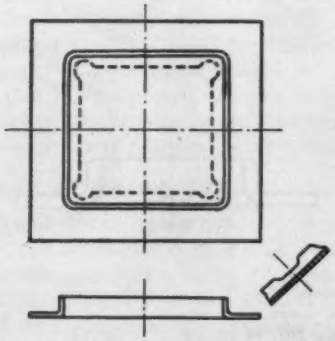


Fig. 10 - Non-round burr

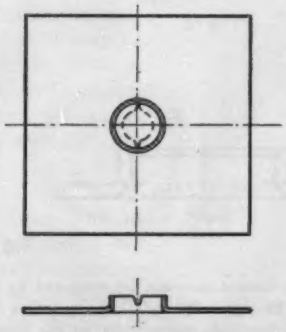


Fig. 11 - Special burr

FIGS. 1 to 11 . . . Burrs are flanges around relatively small holes. The flange is drawn from the inside of the blank by stretching. Ironing of the burr wall may be applied to increase the height or produce both the correct ID and height

thickness in order to reach the maximum height burr obtainable from a flat surface without previous drawing (Fig. 13). If the original metal thickness t is not less than one-fifteenth of the inside diameter of the hole, the burr may be stretched to a height equal to 0.3 times the inside diameter of the burr.

THINNING OF THE SIDE WALLS

The walls of a burred hole will thin out during a burring operation (Fig. 12). For this reason burring punches and dies are seldom made metal-to-metal. The die is machined to a diameter equal to the diameter of the punch, plus two metal thicknesses, minus twice the amount the wall has thinned out. This is necessary in order to make the burr "stand up" and have straight inner and outer walls with accurate diameters.

The wall thickness after burring, t_1 is in proportion to the change in circumference that the hole undergoes. It may be found by the formula:

$$t_1 = t\sqrt{D/d}$$

In computing the mean diameter, the burr wall is assumed to be a full metal thickness.

When the metal is burred around a hole of the same diameter as used for a normal burr, but the burr is from 40 to 60% higher than a normal burr, the metal will thin out in the wall from 30 to 40%.

The reduction in wall thickness of an ironed burr in which the metal has been stretched from a reamed hole of the smallest practical size (Fig. 13) can be found by the formula:

$$\text{Reduction in wall thickness} = t\left[\frac{0.5 \times (h/d)}{0.3}\right] = 1.66\, t \times h/d$$

Burred walls are invariably shown on part prints as having a full metal thickness. When it is planned to reduce the wall thickness an appreciable amount, the engineering department should be informed of the exact thickness that can be expected in the wall, and their approval should be obtained before the dies are made.

DIAMETERS OF PIERCED HOLES

The approximate diameters of holes for burred work are computed by special formulas or by comparison of areas or volumes, depending upon the type of burr. For plain burrs where the metal is not thinned out appreciably and the radius does not exceed one stock thickness (Fig. 12) the following formula is used:

$$D = \sqrt{d^2 - 4dh}$$

where:

D = diameter of hole
d = mean diameter of burr
h = height of burr

When the radius of a burr is greater than one stock thickness, the radius must be taken into consider-

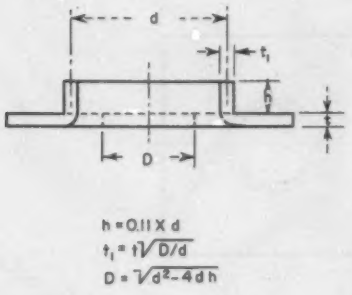


Fig. 12

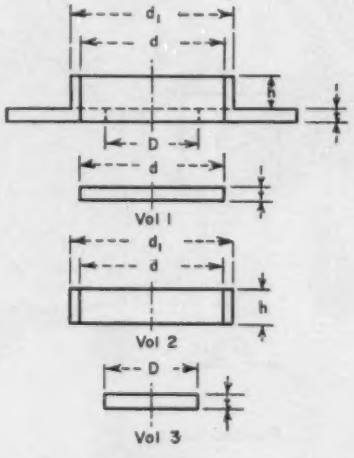


Fig. 13

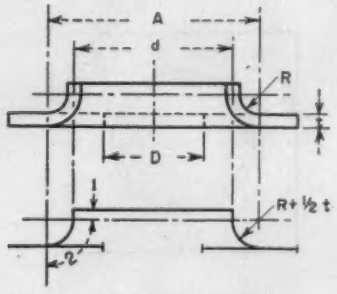


Fig. 14

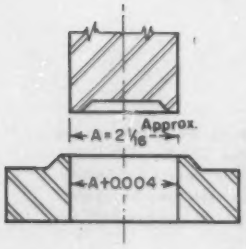


Fig. 15

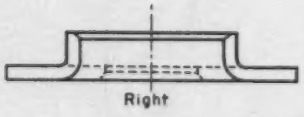


Fig. 16

FIG. 12 ... Diameter D of the pierced hole for producing a normal burr can be computed by formula. **FIG. 13 ...** To find D for an ironed burr, volumes must be computed. **FIG. 14 ...** To find D for a radius burr, areas are calculated. **FIG. 15 ...** A pierced-hole diameter should be shown as approximate on die drawings. **FIG. 16 ...** If the burr will not be reamed, the burnished side of the hole should be on the outside of the burr

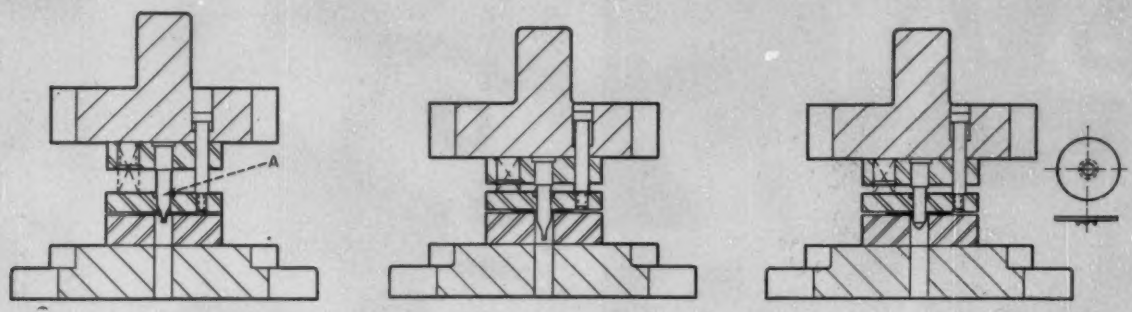


Fig. 17

Fig. 18

FIG. 17 . . . Burrs not larger than 5/16 in. ID are "pierced in the air" the punch first piercing the hole and then turning the metal back to form the flange. FIG. 18 . . . A multipointed punch splits the metal, leaving prongs that can be flattened at assembly with another part

ation and the diameter of the hole must be computed by area. The burr is divided into two sections, as shown in Fig. 14, and the area of each section is then computed. Dimensions should be taken at the center of the stock.

The sum of these areas is subtracted from the area of a circle of diameter A (distance between centers of radii). The square root of the remaining area is then multiplied by 1.128 to find the diameter of the hole D.

When the side walls of a burr have been thinned out or ironed an appreciable amount, the diameter of the hole must be computed by volume. Since the radius around the burr is usually small for this type of burr, the metal in the fillet is ignored and the burr is treated as one having sharp corners both inside and outside (Fig. 13). The volume of the metal in the walls of the burr is computed by subtracting the area of a circle of diameter d (inside diameter of burr) from the area of a circle of diameter d_1 (outside diameter of burr) and multiplying this quantity by the height of the burr h. This volume is then subtracted from the volume of a disk of diameter d and thickness t to find the volume of metal to be removed in the piercing operation. The diameter of the hole D is then found by dividing the volume of metal to be removed by the thickness of stock t, extracting the square root and multiplying by 1.128.

When the diameter of a hole has been computed it should be specified on the die drawing as "approximate" (Fig. 15). If the hole is not to be reamed, the piercing operation should be carefully planned so that the burnished, or good side, of the hole appears on the outside of the finished burr where the greatest amount of stretching takes place (Fig. 16).

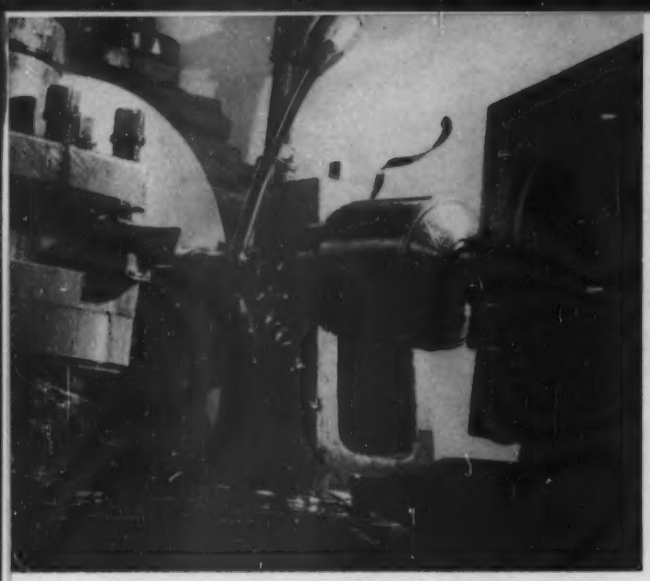
DESIGN OF BURRING DIES

Small burrs which are not larger than 5/16 in. I.D. can be "pierced in the air" and formed in one operation, as shown in Fig. 17. Combination piercing and burring punch A first indents the metal slightly and then pierces a hole, as shown at the left of the illustration. The larger portion of the punch then enters the hole and turns the metal back to form the burr, as shown at the right of the illustration. Tops of burrs produced by this method are somewhat ragged and uneven but are satisfactory for most purposes.

"Jagged" or multiple-pronged burrs are also made in one operation, but no hole is pierced prior to the burring operation. The metal is split back from the center of the burr in three or four places (Fig. 18) with a pointed punch, which is flattened at the end at corresponding places. The prongs on the work are usually flattened over in a subsequent operation to join two parts.

Part XX of Mr. Cope's series will appear in an early number.

"I don't suppose there's anyone in the shop that knows anything about the piece of salami I was using for a bookmark at this article on gears?"



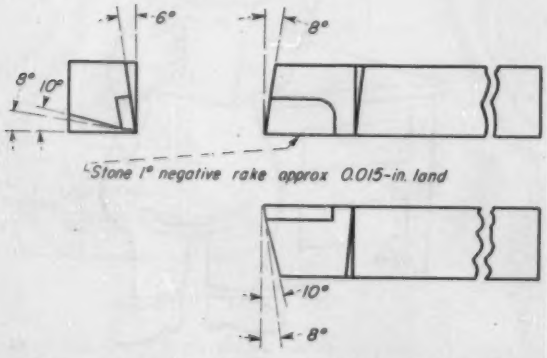
KEY TO SUCCESSFUL COMBINATION of machining ti-stainless was in coolant. Previous grades of coolants yielded either good finish and poor tool life or vice versa, and caused serious dermatitis to the operators. "Gulf Electro C" increased tool life 40%, surface finish averaged 20 mu. in. rms and all signs of dermatitis cleared up

BEST RESULTS FOR MILLING ti-stainless using HSS cutters was with speed of 170 sfpm, feed of 1⅛ ipr, and flood of coolant. When profiling, two spindles were used; one roughing and one finishing. Parts were roughed out allowing 0.010 to 0.015 in. for finishing

Ti-stainless machined like butter

GEORGE GLAESER, general foreman, GILLMORS, INC, HICKSVILLE, L I, N Y

Titanium-stainless, type 321, AMS 5645 (8-10% ti) R_B 96-98, can now be machined without "kid gloves." Problems with machining this material have been attributed to its tough, yet sluggish and galling, action when cut. Practically everyone working ti-stainless agrees that it is next to impossible to achieve good tool life, surface finish, and production simultaneously. However, it's a sure bet, after eight months of trial-and-error methods that Gillmors has found the combination that will yield all three factors consistently. Here's how the company licked the problem:



BEST RESULTS for good tool life and surface finish while machining Ti-stainless, were obtained with these cutting angles used on single point carbide and HSS turning tools

The job has a major 1⅛-in. dia and was set up in a medium-duty turret lathe. Finished parts required a surface finish of 32 mu. in. rms max, with tolerances averaging ±0.001 in. Trial-and-error methods indicated that the parts had first to be roughed all over, using heavy feeds and moderate speeds, leaving approx 0.040 in. on critical dimensions for finishing. Aluminum-type 883 carbide-tipped tools (some form tools turned six dias) with a negative 1° top rake, preferably stoned on the cutting edge, turned out best performance.

On lighter machines not suitable for carbide tools, HSS of similar design was used with equivalent results. Roughing feeds of 0.015 ipr and speeds ranging from 40 to 60 sfpm are recommended. Specific speeds for roughing and finishing operations are:

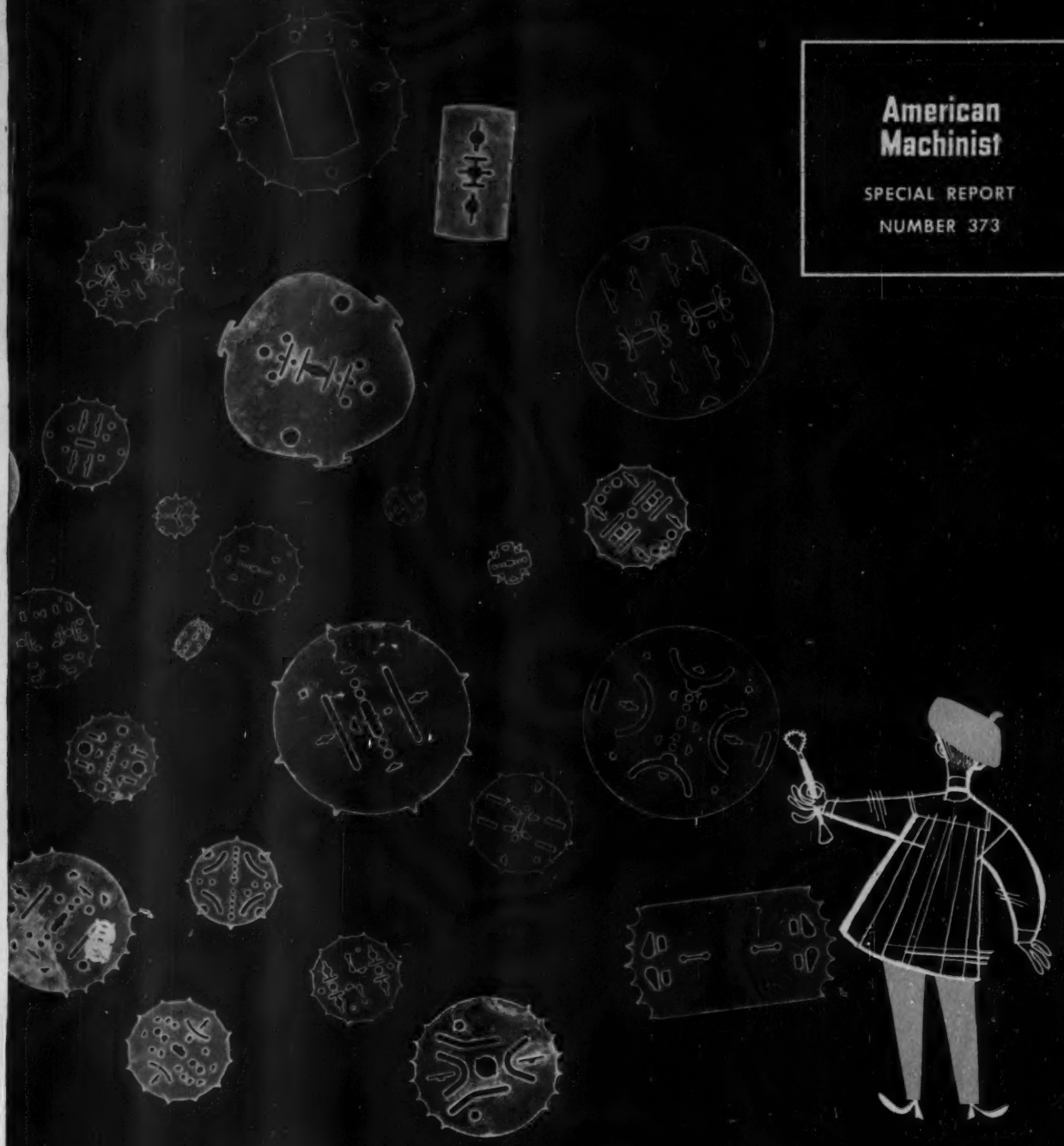
Forming—10 sfpm	Turning—40 to 60 sfpm
Drilling—60 "	Tapping—40 to 60 " (Sulf-flow compound brushed on tap)

When parts are finish-machined, feeds should be dropped down to 0.005 ipr.

A belt sander was used to remove burrs because conventional files dulled rapidly, and caused a secondary "roll-over" feather edge. Ti-stainless castings which could not be handled on the belt sander were deburred with solid-carbide burrs.

Results obtained after 1 month of running with the recommended combination showed 50% increase in production, 40% greater tool life, finer finishes and closer tolerances than required.

American Machinist
SPECIAL REPORT
NUMBER 373



Artists sculpture mica dies

JOHN P. WRIGHT, associate editor

Many top-notch jobbing shops turn out accurate, complex stamping dies. This shop does all that, but also its dies are used for stamping intricate mica blanks, requiring contoured openings some barely visible to the naked eye. Now, after 24 years of perfecting techniques and skills for this type of work, Schneider & Marquard, Inc, (S & M), of Brooklyn, N. Y, reveal for the first time some of the necessary "know-how"

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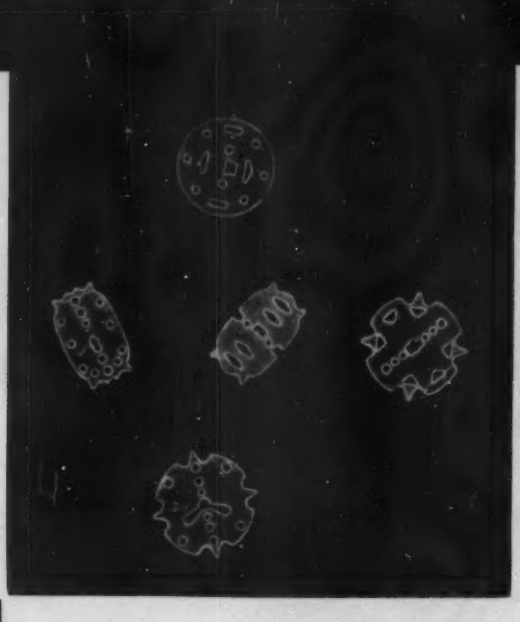
MICA



MINIATURE MICA STAMPINGS photographed double size. Note the wall thickness between openings and the clean, exacting workmanship on all the profiles. Tolerances on many of these openings run as low as ± 0.0002 in.

When Nature made mica, she provided an excellent electrical insulator capable of withstanding high temperatures, and adaptable to hand and machine fabrication. Mica is classified as a mineral, it is a body produced by the process of inorganic nature, usually with a definite chemical composition and a certain characteristic atomic structure which is expressed in its crystalline form and its other physical properties. Mica may also contain impurities, such as manganese and iron.

The most important micas used commercially are musconite and phlogopite, available in various sizes and qualities. Largest producers of musconite are India, Brazil and Argentina. In general, musconite is used as an electrical insulator because of its high dielectric strength and low loss or high Q factor.

Phlogopite or magnesium mica bears the name "amber mica" in the trade and is second in commercial importance to musconite. It is the only mica in the magnesium group that is practically iron-free, and is commonly found in Canada, Mexico, and Madagascar. Phlogopite mica is used primarily for its high resistance to heat.

The mining of mica does not permit such mechanization as is possible in mining gold, coal and other materials. Mechanical equipment can be used for mining scrap mica, but practically all of the quality micas must be blasted or dug out of the ground by hand.

Cobbing is the first operation after getting the mica out of the ground. This consists of separating the books of mica from mine-run scrap and removing all rock and earth adhesives.

The next operation, known as rifting, consists of opening up crude mica books and splitting them into blocks of from 0.007 to 0.030 in. thick. Third operation entails anyone of three methods of trimming mica; namely, thumb, knife and shear. Thumb trimming is breaking off of loose edges by hand. Knife trimming consists of cutting out all cracks and other imperfections, leaving a bevelled edge all around. Shear trimming is similar to the knife technique except that there are no bevelled edges and trim usually results in a rectangular shape.

Fourth operation in the preparation of the raw material is sorting

AN ARRAY OF STAMPED MICA PARTS, photographed full size to show contrast, intricacy, and sharpness of contours. Some of the openings are as small as 0.016 in., widths of slots as narrow as 0.005 in. and tolerances run to ±0.0005 in.

block mica and classifying it into grades and qualities in accordance with commercial specifications.

The final step is splitting, a highly skilled manual operation performed with special knives. Some mica must be split to as fine as 0.001 in. or less within very close tolerances. Here again no form of mechanization has been developed that can replace essential accuracy and skill of experienced mica workers. Six months training or more is required before a worker becomes reasonably proficient.

Mica varies in price from 15 cents per lb to over $100, depending on quality, size and thickness. The largest sheets, needed for mosaics of TV camera tubes, are worth up to $500 a pound. Over 8,000,000 lb of mica splittings are imported annually, at an average price of $1 a pound.

Cutting Mica

Mica can be cut and shaped with paper shears, scissors and pen knife. It can also be drilled or machined on any of the common machine tools.

Thickness

The fabricator can supply mica under 0.001 in. plus or minus 0.0001 in. for Geiger-counter tubes.

Because of the complex and peculiar nature of the material, the greater the understanding between the mica fabricator and mica buyer, the greater the savings that will result for the purchaser.

SYNTHETIC MICA

Synthetic mica, with essentially the same properties as natural mica, but able to withstand much higher temperatures, has now been crystallized successfully at the National Bureau of Standards.

In the Bureau's work on synthetic mica, the requirements of eventual quantity production have always been kept in view. Bureau scientists are using fluorine as a crystallizing agent to grow crystals of mica without using high pressure. Natural fluorine is a gas, poisonous and difficult to control, but a group of synthetic fluorine compounds (fluorosilicates), provides a convenient way of introducing fluorine into mica synthesis. Raw materials for making synthetic mica are similar to raw materials sometimes used in making glass, quartz, magnesite, bauxite, and a fluorosilicate compound. The mixture is placed in an electric furnace at a temperature of nearly 1400C. As the furnace cools, mica crystals grow from a tiny seed at the bottom of the crucible. Those crystals free of impurities are clear and transparent, and thin flakes are easily split away along the planes of natural cleavage. The synthetic form has physical properties that compare favorably with natural mica. Electrical measurements on several clear flakes ¾ in. square by 1/32 in. thick indicate a dielectric constant of about 6.3. Largest crystals grown so far at the Bureau have a surface area of 4 sq in.

Successful control of crystal orientation in the growth of synthetic mica would mean that machine methods could be used for a large-scale domestic production of sheet mica. In this way, mica synthesis could make the United States self-sufficient in high-grade mica insulating materials.

to see how mica dies are made...

TURN PAGE

Typical compound mica die . . .

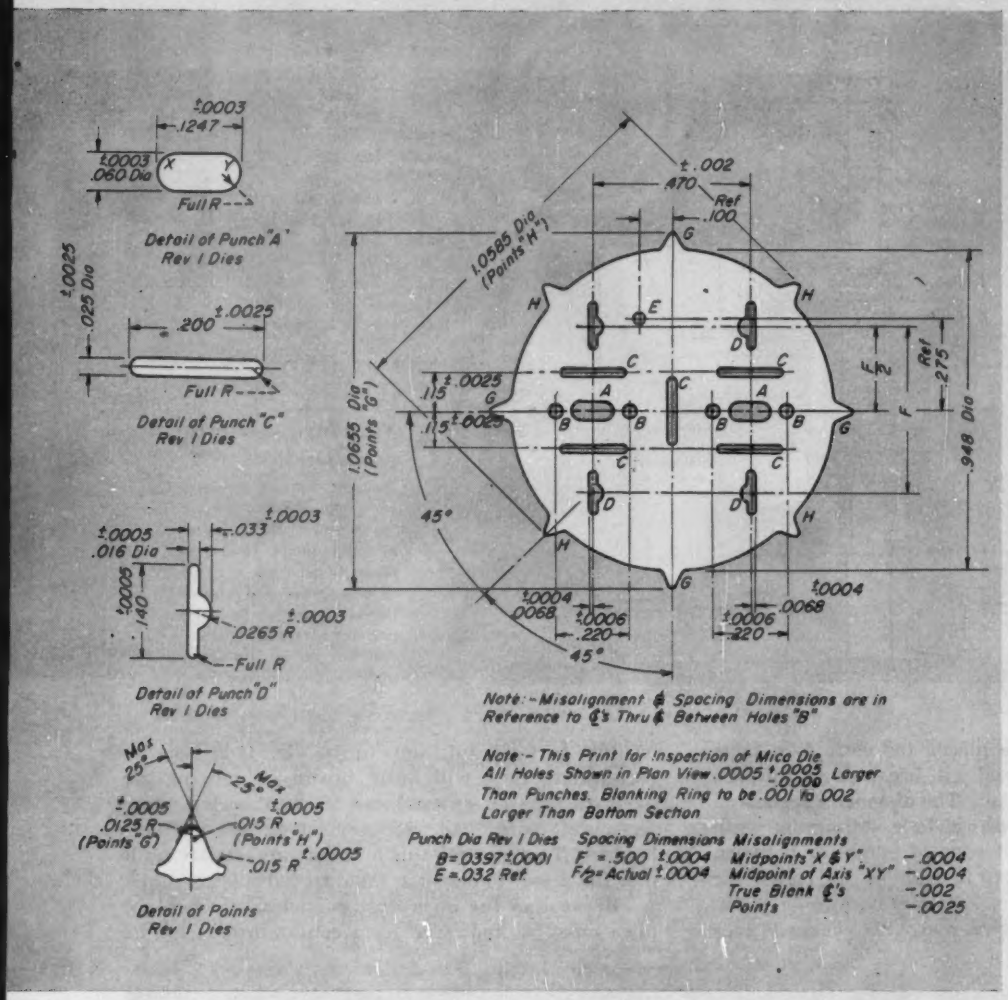
with upper section indexed 180° to facilitate photography. Note knockout plate in retracted position and unsupported piercing punches. Tube on right is intake nozzle for air stream to clear away mica-dust particles from between punches. Hole in knockout plate serves the same purpose by directing stream of air on female die, and prevents mica blank from adhering to face of knock-out

Stamping mica with

Compound dies are required for stamping mica, because natural mica is supplied in small, irregular shaped, wafer-like pieces, which must be hand loaded "piece-meal" into the die. Each mica pattern or part requires its own special precision die to produce clean-edged parts free from burrs, delamination and cracks. This die, even for the simplest design, requires expert diemakers and precision equipment in its manufacture, and is further complicated by the fact that a new die is required not only for each change in pattern but also for each change in thickness. As you will shortly see, these dies are so highly specialized in their design and construction that ordinary tool-and die-making experience is insufficient to build a die capable of producing parts accurately and in satisfactory quantities.

Mica dies are built by specialists classified as jig borers, form grinders, toolmakers, lathe hands, intricate-contour-milling hands, master templet makers, and diemakers for hand filing and finishing of the dies.

When the part drawing is first submitted to S&M by the customer for a bid, the two partners estimate its cost based on their store of spare shaving punches, cutters, and piercing punches. These spares, with their part and die drawing numbers are catalogued in the shop manual, and when they can be used either directly or for reference on the new job, their numbers are noted on the new die drawing. Next step is to break the die down into its component


Detail of Punch "A" Rev 1 Dies
Detail of Punch "C" Rev 1 Dies
Detail of Punch "D" Rev 1 Dies
Detail of Points Rev 1 Dies
Note:-Misalignment & Spacing Dimensions are in Reference to ℄'s Thru ℄ Between Holes "B"
Note:-This Print for Inspection of Mica Die. All Holes Shown in Plan View .0005 +.0005 -.0000 Larger Than Punches. Blanking Ring to be .001 to .002 Larger Than Bottom Section
Punch Dia Rev 1 Dies
B=.0397±.0001
E=.032 Ref
Spacing Dimensions
F=.500 ±.0004
F/2=Actual ±.0004
Misalignments
Midpoints "X & Y" -.0004
Midpoint of Axis "XY" -.0004
True Blank ℄'s -.002
Points -.0025

Corresponding die drawing . . . drawn at 2:1 scale. Dimensional tolerances on profiles and specifications are average in this line of die-making. Tolerance is ± 0.001 in. unless otherwise noted. Average angular tolerances on dies are ± 30'; occasionally some call for ± 5'

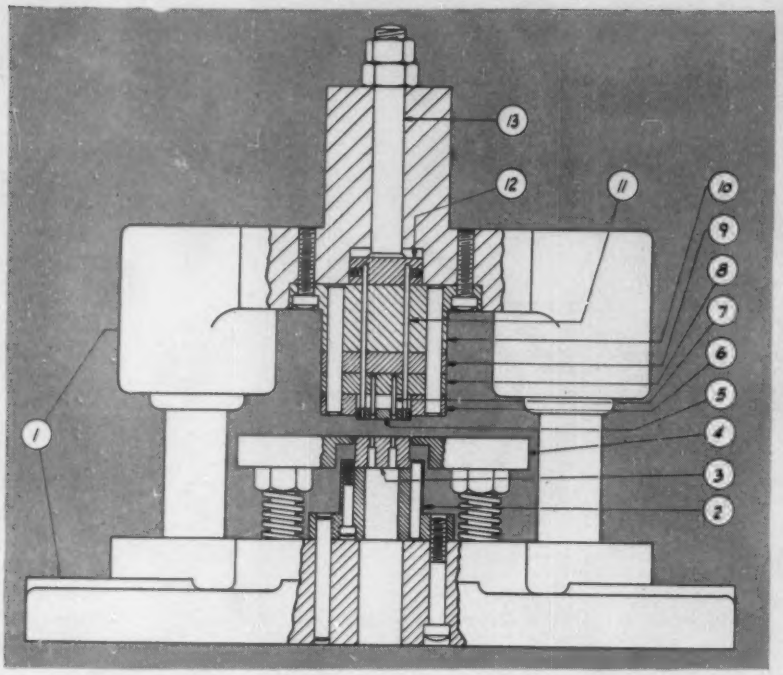
compound dies

parts and assign each component to the specialist best qualified to handle it. This teamwork helps minimize cost of the die and expedite its fabrication.

Limitations of the mica material necessitate that certain factors be considered in die sign:

1 . . Maximum thickness should not exceed ½ dia of the smallest piercing punch.

New and spare punches . . . (shaving and piercing) are in glass vials and filed in storage drawers. Label on vial carries part number, sketch, and critical dimensions of punch. Many similar punches, both round and contoured, but of the same shank diameter, differ from each other only in increments of 0.0001 in. on critical dimensions. Storage drawers contain over 1000 different shapes and over 12,000 individual punches



PART	NAME	MAT.
1	Die Set	C. I.
2	Punch Base	C. R. ST.
3	Bottom Punch	T. ST.
4	Stripper	C. R. ST.
5	Knockout	T. ST.
6	Die Plate	T. ST.
7	Piercing Punch	T. ST.
8	Punch Plate	C. R. ST.
9	Backing Plate	C. R. ST.
10	Die Base	C. R. ST.
11	Knockout Pins	C. R. ST.
12	Knockout Block	C. R. ST.
13	Knockout Rod	C. R. ST.

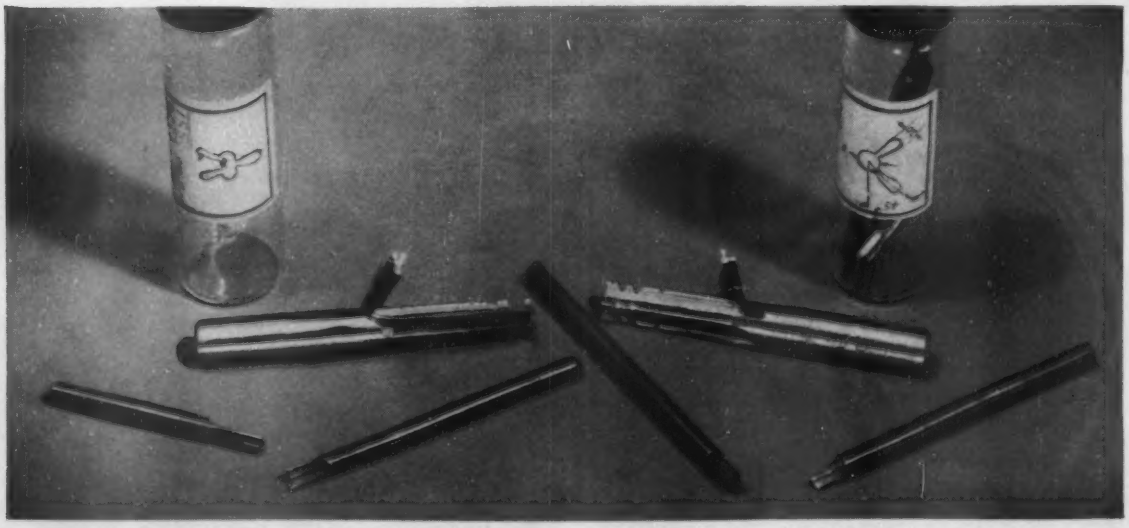
Standard mica die construction . . .

showing floating knockout plate and unsupported piercing punches. Note absence of strip guide for stock. Dieset is mounted in an inclinable press and pierced blanks are carried to sealed tote pans through channel slide to protect the parts from contamination

2 . . Holes should not be placed too close to outside edge, because the material will break down through cracking and delamination. The distance depends on thickness of mica and size of hole. Minimum wall, either between hole and edge of blank, or between two holes, should be 0.080 to 0.100 in. for condenser films, and other parts not less than 0.020 to 0.025 in.

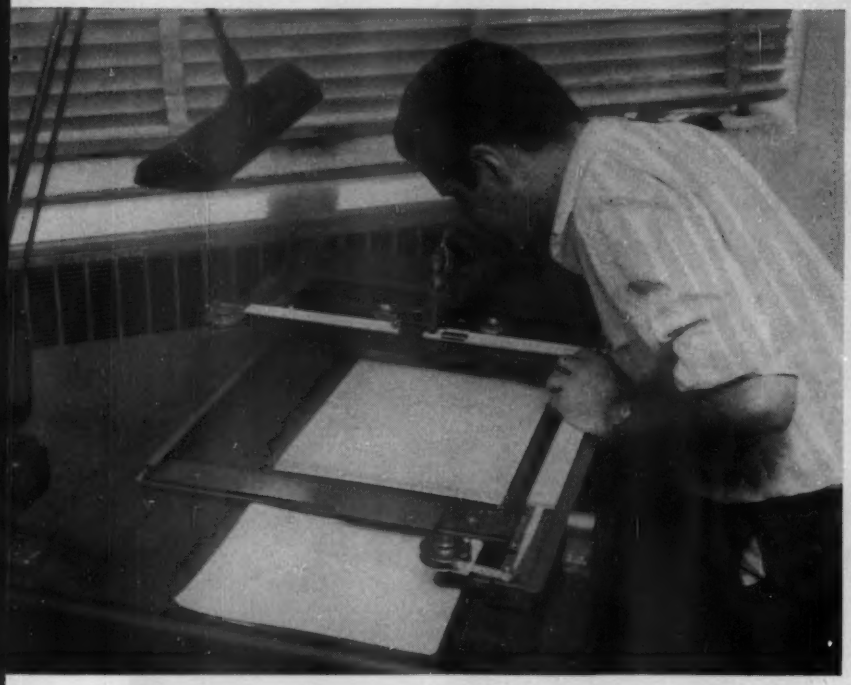
3 . . Mica is highly abrasive, and when worked gives off dust particles injurious to the die. If allowed to accumulate they will build up on all moving die parts to such an extent, that in short order, these parts will seize and rip themselves out of their holders. To overcome this problem, air jets are built into the dieset to disperse the dust particles.

4 . . Because of the mica-dust particles, and because mica must be kept free from contamination for its



Milling cutter, shaving punches, and piercing punches . . .

are contained in each vial. Piercing punches are draped over the milling cutters, while the two punches in the center are for shaving the start of finished profile. Pilots on end of shaving punches guide the lead-in of punch, are milled on punches, their location established by coordinates



Polar coordinate plotter . . .

incorporating a microscope, vernier and micrometer screw, is used here to lay out transparent templets. All terminal points, points of tangency and centers for radii in the layout must be calculated. At the intersection of all coordinates the polar coordinator will make a pin-point impression in templet. Straight lines can be scribed in by coordinator, but radii must be scribed in by hand from coordinate points with heavy-duty rigid dividers. Lines on templet are then filled in with eyebrow pencil. Layouts, where size permits, can be blown up to 100:1 with this instrument. File cabinet (right) contains templets-for comparator by job number from last two years

dielectric properties and prevention of flashover, lubrication in any form is not permitted. In addition, its use would be an open invitation for these dust particles to establish a foothold. However, lubrication has been used on dieposts because they have been adequately protected with accordion boots.

5 . . Mica must be punched free from burrs, delamination, and cracks. To accomplish this 0.0002-to 0.0003-in. side clearance is held between the piercing punches and die openings.

The more intricate phase of building mica dies centers about the cutters, shaving and piercing punches, and female die. Essentially, here is how the contoured punches are made:

a. The desired contour of the piercing punch is blownup on a drawing at 40:1.

b. From the drawing a transparent plastic templet is made for use on the comparator

c. Milling cutters, contour-ground and lapped from HSS hardened rounds, are used for the punches. Accuracy of their contour is checked to the templet.

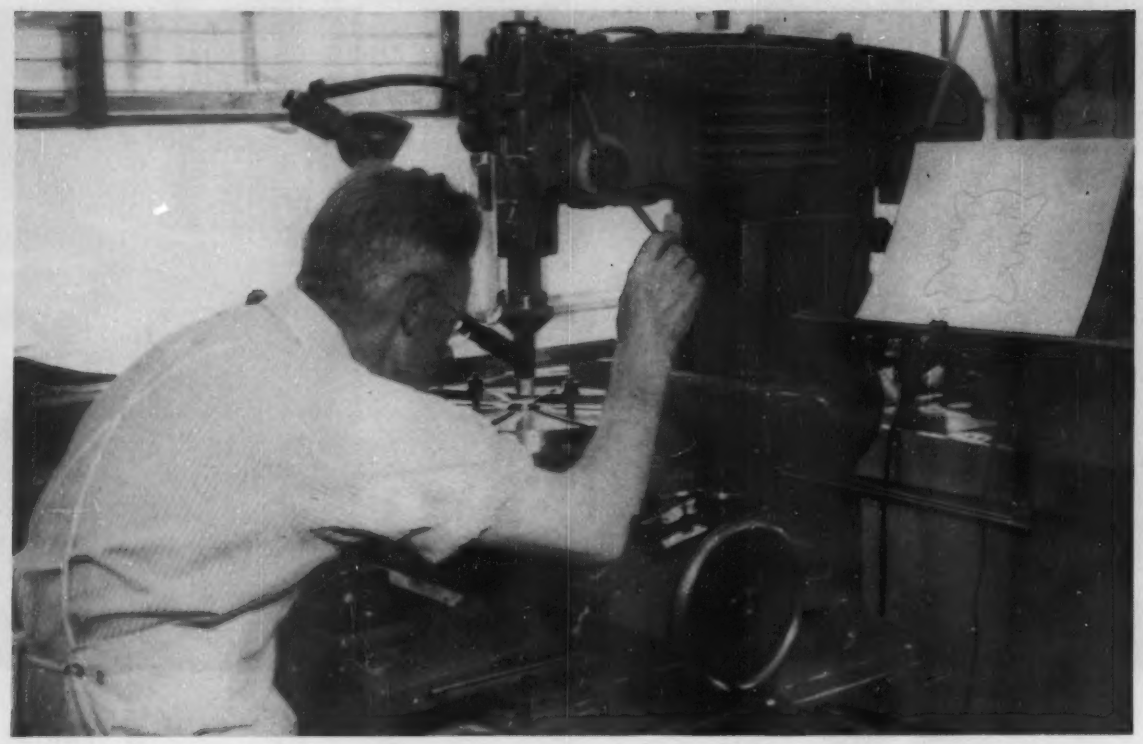
d. Small radii, and contours that cannot be ground on the profile of the cutters, are blended in with hand stoning and diamond-charged wire laps.

e. Cutting edges of the cutter are radially backed-off in a special fixture designed by S&M.

f. Shaving and piercing punches of oil-hardening drill rod are then machined with the cutters.

Heat-treating room . . .

includes device (behind operator) designed and built by S & M for hardening and tempering full-length drill-rod diameters ranging from 0.020 to 0.078 in. Device is controlled by optical pyrometer and makes possible continuous hardening and tempering. Flame is adjustable to a fixed position and controlled to prevent excessive oxidation. Rods are consistently heat treated to uniform hardness, free from warping, remaining perfectly straight



Setting up die plate . . .

(lower female die) on rotary table of jig borer. Diemaker is using centering microscope to align and center die to axis of rotation of rotary table and machine spindle. He is working to enlarged die layout on his right which has diagonal distance of 0.170 in. across points of profile. When setup he will take care of reference holes and holes for removing excess material by either drilling, rose reaming, boring, or gun drilling, depending upon which is most feasible

Here's how the female "die plate ring"

1 . . Die ring is made from 01 oil-hardening tool steel (ketos in this case) because it was found that this material had less tendency to workharden when hand filing the cavity walls.

2 . . After the die openings are laid out, each individual opening is again laid out to take as many drilled holes as possible, that maximum waste material may be removed, thus minimizing machining and filing time.

3 . . Holes are then drilled in jig borer, many as small as 0.006 in. dia.

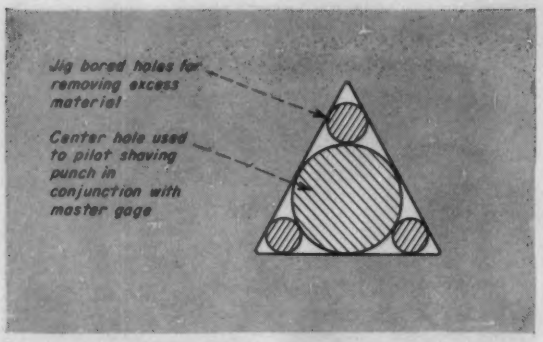
4 . . Excess material between drilled holes is removed with the aid of jeweler's blades, some hand ground to special thicknesses by the diemaker.

5 . . Shaving punches which are duplicates of piercing punches are then aligned to the die opening, and when positioned, shave the exact profile of the opening to a depth of approx. 0.005 in.

6 . . Die openings are filed to the shear line on modified reciprocating filing machines. The modification permits a very short stroke of the file and brings the reciprocating action in closer contact with the base of the die. This principle minimizes deflection of the short delicate files, thereby permitting greater accuracy in attempting to blend the shear line while filing.

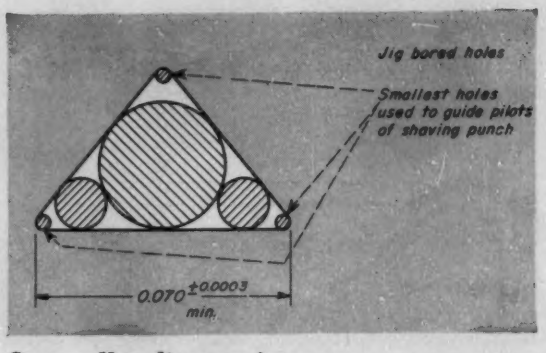
7 . . Diemaker hand files from the underside of the die to the shear line left by the shaving punch, holding the depth of the true profile to 5/32 in. from top of die. Because of the abrasive action of mica when cut, resharpening of the die is frequent, thus 5/32 in. of true profile is provided to take care of this contingency.

8 . . Before hardening, accuracy of die openings is checked in comparator to the templet, and later checked for quality control under a microscope using 40X magnification.



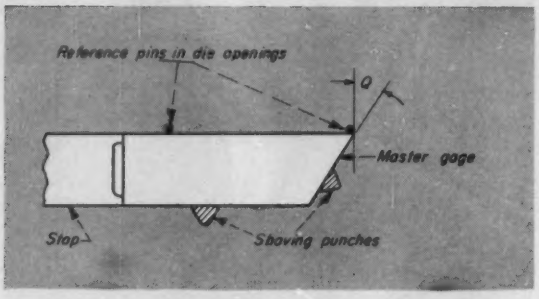
Here's how larger die openings . . .

are laid out, when master gage is to be used to align shaving punch



On smaller die openings . . .

where shaving punches would not afford sufficient banking surface to master gage, reference holes, appropriately located, guide pilots of punch



To align shaving punches . . .

a master gage, banking against pins located in die openings, establishes angular relationship of shaving punches to reference holes

Diemaker specialist . . .

finish-filing cavities in a die held on a filing board. He uses loupes varying from 3 to 10X increasing in magnification as he nears the outline of the shape left by the shaving punch. Illuminating frosted glass is used for examining surfaces in die cavities for cleanliness of lines, sharpness, and possible scoring. Variety of special ground Swiss files permit access to small contour openings

is made:

When the die is ready to be assembled, the diemaker provides 0.002 to 0.003 in. clearance between the piercing punches and the knock-out plate. Although this practice leaves the piercing punches unsupported for their entire length, nevertheless it is essential in order to provide passage for the stream of air to blow the mica dust particles from between the piercing punches and knock-out plate.

INSPECTION

Dimensional accuracy of die components and mica blanks is checked solely on the comparator using 40X magnification for the medium to larger profiles and as high as 100X magnification for smaller profiles.

Because mica must be punched dry, dust particles and flakes tend to distort the pierced blanks, thereby making final inspection difficult. Outer layers of the mica are cut sharp, but the inner layers possess

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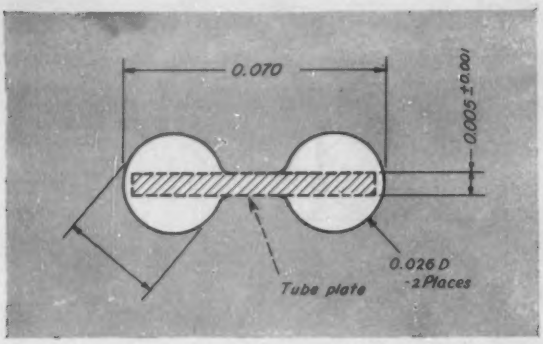
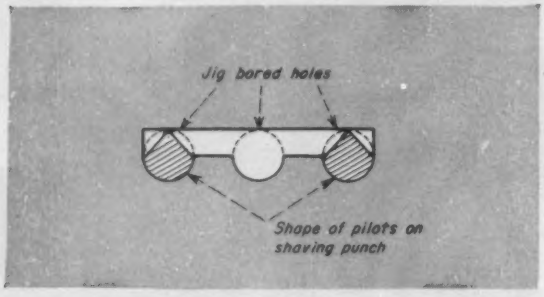


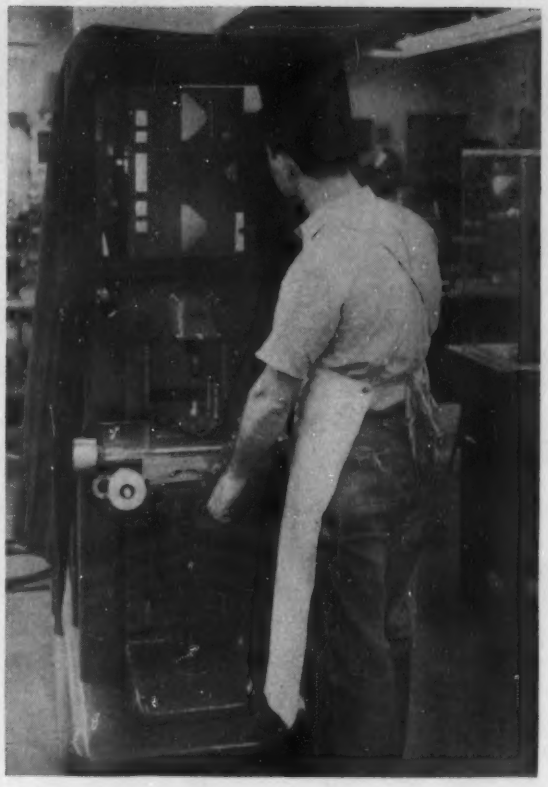
Shape of die opening . . .

and punches is laid out when a 0.005-in. slot is required. Slot is used to guide and support tube plate on two sides only, therefore holes serve to strengthen punches. This was a design change requested by S & M



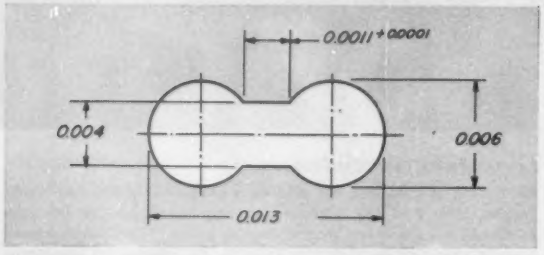
This 0.005-in. slot . . .

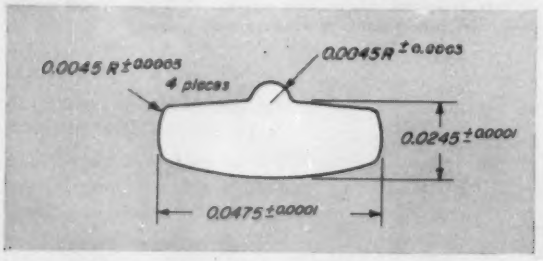
had to fully support tube plate on one side only, second side served to align strip. Here again jig bored holes were used so punches could be strengthened and to guide pilots of shaving punch. Crown on pilots of shaving punch provides easier entrance and alignment of punch



Checking accuracy . . .

of die openings to master templet on a comparator at 31¼:1. Several sample mica parts are checked to the same setup, but pose a bigger problem because pierced edges of mica are not as sharply defined as die edges, but rather fuzzy





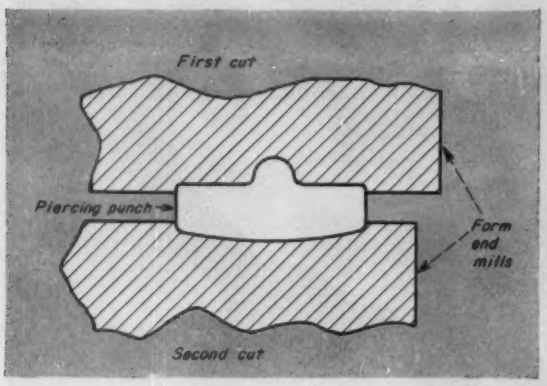
More-intricate profiles . . .

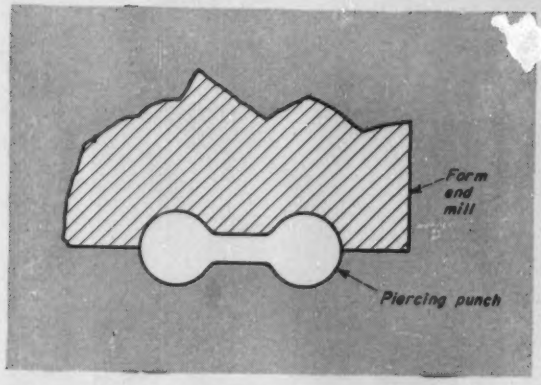
go hand-in-hand with the tighter tolerances. Accuracy of these contours will be checked at 100:1 magnification on the comparator

a fuzzy edge. Therefore, several parts must be checked to arrive at a satisfactory average reading.

TEAMWORK IN THE SHOP

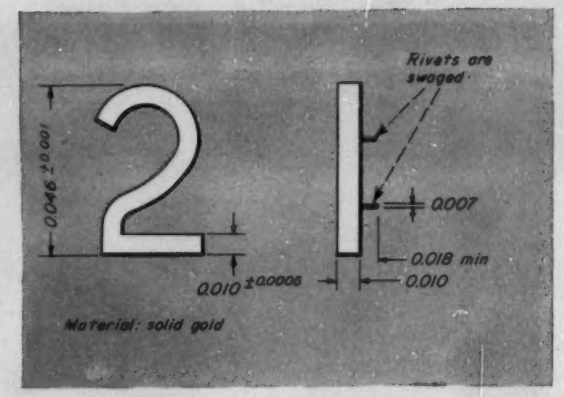
Schneider & Marquard continuously work with their men in the shop on a warm, friendly, relaxed, yet business-like manner. This relationship and supervision has been a most desirable function for the team as a whole, because through the 24 years it has been in effect, it has helped to reduce the otherwise overburdening responsibility, tension, and nervous strain builtup in the men from the complexity of their work. This policy has shown excellent results and has been beneficial to both employer and employee from the standpoint of upholding morale and motivation within the plant. Evidence of the owners' consideration for their em-





Form end mill . . .

ground by the diemaker, mills profile on the piercing and shaving punches. Most difficult operation in this process is making the cutter, and holding punches to desired accuracy throughout heat-treating. Once punches check-out at inspection, the worst is over



Versatility . . .

of diemakers permits building as side line, dies used for many purposes other than mica. Here's a die layout taken from a complete set calling for solid gold numerals for wrist-watch faces. Conventional jeweler's blades and Swiss files had to be hand ground to thicknesses of 0.004 in. to cut and finish-file die openings. Back face of numerals were swaged for pegs. Diemakers call these dies "dillies"

Here partners are discussing . . .

with one of the diemakers the fine points of a die before it is released for hardening. Loupes attached to eyeglasses of S & M is standard equipment with these boys

ployees is reflected in the facilities of their new plant which they designed and had built in 1951. It contains six large air conditioning units, a fully equipped emergency hospital, tiled washroom and locker room, and a large refrigerator for workmen's lunches.

Employee relations are further boosted by monthly meetings held between owners and key men. Discussions center about shop problems, economics, improvements, and personnel. There is also a profit-sharing plan in which all employees participate after they have been with the company a year. This plan offers a fixed percentage of the profits to three classes of employees: First, key men with 10 years service or more; second, actual production employees with 3 years or more, and third, production and non-production employees with 1 year and over.

for apprentice training program . . .

TURN PAGE

Here's one man . . .
that spent his evenings putting the theme of this phase of diemaking in oils as an inspiration for his apprentices. "Chip" painted this portrait shortly after being appointed sole instructor of the apprentice-training program

Apprentice training program

Tool and diemakers who must possess the personality and skills so necessary for this specialized phase of diemaking are few and far between. To safeguard their future supply of manpower Schneider & Marquard started a formal apprentice program of their own which has now been in force two years. Here are some of the highlights of this program:

Many years ago, the two partners started what might be called an informal apprentice-training program. It was very limited in its scope because the trainee received his instructions working on the bench with the regular diemakers. There was no formal course of instruction from simple to complex, nor was there any provision for a course of study of related subjects. Other drawbacks were the long hours of daily work on live jobs, which in itself taxed the patience of the diemaker, let alone having to teach a green hand. From this condition, personality problems arose between diemaker and apprentice, and were further complicated by the fact that many a good or top-notch diemaker is not cut out to be an instructor. All in all, this method of training apprentices proved very costly, troublesome, time consuming, and never fulfilled the necessary quota of apprentices.

It was at this point that the formal program came into existence under the aegis of the New York State Apprenticeship Council. Initially, the program was drawn up in conjunction with the NTDMA and Apprenticeship Council. Using their recommendations and advice, S&M formulated the program to fulfill their own requirements and needs.

Before the program could go into full swing, there still remained one problem: the appointment of an

Apprentices receiving instruction . . .
on the techniques of hand-filing die contours. Students in the early stages are learning to file to layout lines, while more advanced students are finish filing contour to shear line left from shaving punches. One apprentice with 1¾ years instruction has turned out many new customer dies

instructor. After careful study of all the applicants, a young diemaker, Chip Ciaffa, was selected as having the best qualifications to make a good teacher. He started with the company at the age of 15, working on a part-time training basis. At 16 he was employed full time and served a four-year apprentice-training course. For the next seven years, he worked as a full-time diemaker specializing on extremely small intricate dies.

The program initially started with seven young apprentices, and this number has gradually increased to nine, so the number of apprentices to be indentured shall be limited to the maximum of one for each three journeymen or fraction thereof.

Each student receives $150 worth of tools for his first 1000 hr. If he fulfills the requirements of his probationary period and has signed the apprenticeship agreement papers, weekly deductions will be taken from his pay check and credited towards all the tools supplied to him by the company. At the conclusion of his four years of training, he will own over $400 worth of tools.

HOW TRAINEES ARE SELECTED

An applicant must be a graduate from the mechanical or machine-shop courses of a technical or vocational high school. While attending school he must have attained relatively good grades. Next he is interviewed by the owners jointly and later by them separately. At the time, the main purpose of the interviewers is to try and determine whether the applicant possesses the particular qualifications required for this type of highly intricate work. Does he display the kind of sincere, deep-rooted interest,

Initial beginning of apprentice training . . . on live work includes some maintenance and repair jobs ranging from simple to complex. However the apprentice spends the major part of his time receiving instruction and training on new dies, which eventually covers every phase of diemaking

patience and stick to-it-iveness to make their kind of diemaker?

During the interviews, the applicant is acquainted with the shop, its machines, tools, skills, and the mental and physical problems associated with the work.

Highlights of apprenticeship standards

Total 8000 hr—with 144 hr per year of related school instruction. Totaling 576 hr

TRAINING SCHEDULE:

Apprentices shall receive instructions and experience on the machines listed below but not necessarily in the sequence listed. The purpose of this schedule is to give experience and instruction in all branches of the trade as is necessary to develop a practical, thoroughly skilled craftsman

	Approx hr
Drill Press	800
Shapers	200
Milling Machines	500
Lathes	300
Grinders	1000
Filing Machine	800
Contour Cutting	200
Heat Treating	200
Bench Work	4000
Total	8000

Miscellaneous Machines . . . Machinery repair and such other work as may be considered adequate to complete the experience necessary to attain the skill and versatility required of journeymen.

WAGE SCALE

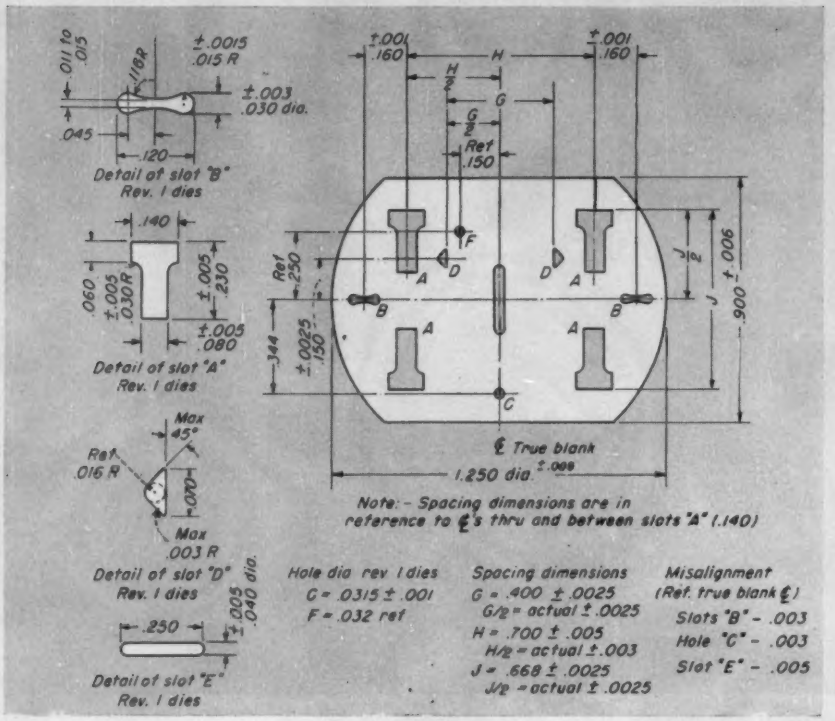
Apprentices shall be paid a progressively increasing wage scale based on the wage rate paid journeymen in the trade they are learning:

First	1000 hr	—	$1.20
Second	" "	—	1.25
Third	" "	—	1.30
Fourth	" "	—	1.40
Fifth	" "	—	1.50
Sixth	" "	—	1.60
Seventh	" "	—	1.70
Eighth	" "	—	1.80

Credit for previous experience shall be given by paying the wage rate for period to which such credit advances the apprentice, upon signing the apprenticeship agreement.

RELATED SCHOOL INSTRUCTION

1. Course of study for apprentices was drawn up by Schneider & Marquard at the request of the school faculty. Schedule of classes is 4 hr per wk, 36 wk per year. Time spent in related instruction shall not be classed as hours of work and shall not be paid for.


Detail of slot "B" Rev. 1 dies
Detail of slot "A" Rev. 1 dies
Detail of slot "D" Rev. 1 dies
Detail of slot "E" Rev. 1 dies
Note: - Spacing dimensions are in reference to ℄'s thru and between slots "A" (.140)
℄ True blank
1.250 dia.
Hole dia rev. 1 dies
G = .0315 ± .001
F = .032 ref
Spacing dimensions
G = .400 ± .0025
G/2 = actual ± .0025
H = .700 ± .005
H/2 = actual ± .003
J = .668 ± .0025
J/2 = actual ± .0025
Misalignment (Ref. true blank ℄)
Slots "B" - .003
Hole "C" - .003
Slot "E" - .005

Female die and die layout . . .

to which apprentice worked after 21 months of training and built as his 22nd mica die. Even for a good diemaker, those are tricky shapes and pretty tight tolerances when you consider scale of drawing is 2:1

2. In case of failure on the part of any apprentice to fulfill his obligations as to school attendance, the employer may recommend cancellation of his agreement to the New York State Apprenticeship Council.
3. If the grades of the apprentice should fall below the proficiency level relative to the trade being followed, such deficiency will be called to the attention of the employer by school authorities carrying on the related work.
4. Classes of related instruction shall be arranged for by New York State Education Dept. in cooperation with local school authorities and when established shall be under supervision of local school authorities.
5. Course content of related instruction shall be determined by representatives of the plant, in conjunction with New York State Education Dept and the local school authorities.

COURSES OF RELATED TRADE INSTRUCTION

1. Blueprint reading — elementary and advanced
2. Shop sketching
3. Drawing
4. Science
5. Theory
6. Mathematics
7. Industrial history and labor problems
8. Course in safety
9. Principles of gage design
10. Layout, inspection and assembly practice

One-year apprentice . . .

"feeling his way along" on a jig borer. He is being instrcuted on small hole location and drilling of the openings in the female die. The first thing he learns is that there is no "putting-on tool" in die-making; therefore, extreme care, patience, and double-checking is a prime requisite

11. Principles of jig and fixture design
12. Principles of cutting tool design
13. Principles of punch and die design

The amount of time devoted to each subject and sequence they are to follow will depend upon type of work being performed by the apprentice in the plant. It is intended that classroom instruction shall be so integrated with work in plant that the apprentice and company shall receive maximum benefits from such instruction.

HOURS OF WORK

Work day and work week for apprentices and conditions therewith shall be the same as that of journeymen. Overtime hours worked by apprentices shall be counted for credit on their apprenticeship as actual hours worked.

SUPERVISION

Employer shall designate a supervisor of apprentices who shall be responsible for acquainting beginning apprentices with the purpose of apprenticeship, their schedule of work, related instruction, transferring of apprentices, keeping of adequate records, grades in schooling, etc. During their work period, apprentices shall be under the direct supervision of foremen and journeyman of department in which they are working.

PERIODIC CHECK

A periodic check on progress of apprentices shall be made each six-month period of advancement.

LAY-OFFS

When business conditions make it necessary, the Apprenticeship Agreement may be suspended until such time as conditions improve. Apprentices laid off under such conditions will be returned to employment as apprentices, however, before any new apprentices are indentured.

ADJUSTMENT OF DIFFERENCES

Apprentices are encouraged to take up all individual suggestions, recommendations, or grievances with their work or training with their training supervisor. In the event that any matter between the apprentice and employer, or problems relating to apprenticeship cannot be satisfactorily adjusted, either party may consult with NY State Apprenticeship Council.

ADVANCEMENT

Qualifying apprentices will receive priority on all advancements within the plant and can progress up to top position key man (working foreman) heading up a group of men.

American Machinist

SPECIAL REPORT
NUMBER 374

How to Understand

ANNEALING AND HOT WORKING OF METALS

SAMUEL STORCHHEIM, metallurgical engineer, FOREST HILLS, NY

By working metals at room temperature, we learned that the grain structure is broken up and greater strength is achieved (AM Special Report No. 372). But cold deformation can proceed just so far. Rupture will occur unless metals are somehow softened or returned to their original unstressed condition. The metallurgist does this by annealing, which can be repeated as often as necessary, in order to attain the final shape desired. Of course, there are good reasons why hot working may be required instead of cold working, and the metallurgical reasons are given.

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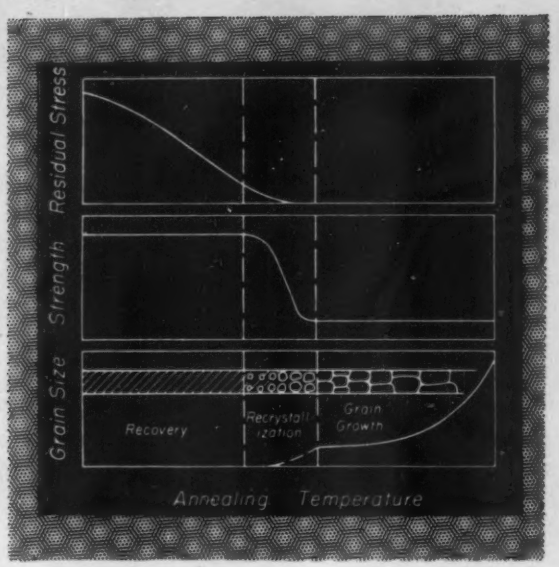


Metals Handbook

SCHEMATIC REPRESENTATION OF RECOVERY, recrystallization and grain growth on the residual stress, strength and grain size of a cold-worked metal. The shaded area continuing to distorted circles and grains shows how grain size changes with increased annealing temperature.

Annealing rejuvenates metals

When a cold-worked metal is gradually heated, internal stresses are considerably reduced. This "recovery" is accomplished without apparent change in the structure. The danger of corrosion cracking; that is, potential failure in corroding media, is considerably lessened. Sometimes the recovery process is termed "stress relief".

RECRYSTALLIZATION

By heating the same metal to a still higher temperature, a startling change takes place. Where we originally had fragmented, ruptured, distorted grains, little particles of new grains nucleate (form) and start to grow. This process is termed recrystallization. The new crystals are equiaxed — of the same dimension in all directions — as was the case before coldworking.

With continued time at recrystallizing temperature, more and more of crystallites appear throughout the disturbed metal. The first ones, as well as the new ones, eat up the disturbed metal. Eventually they bump into each other when all of the cold-worked metal is gone. At this point the metal is completely recrystallized. Now, strength and hardness are considerably less than prior to recrystallization, but elongation is much greater.

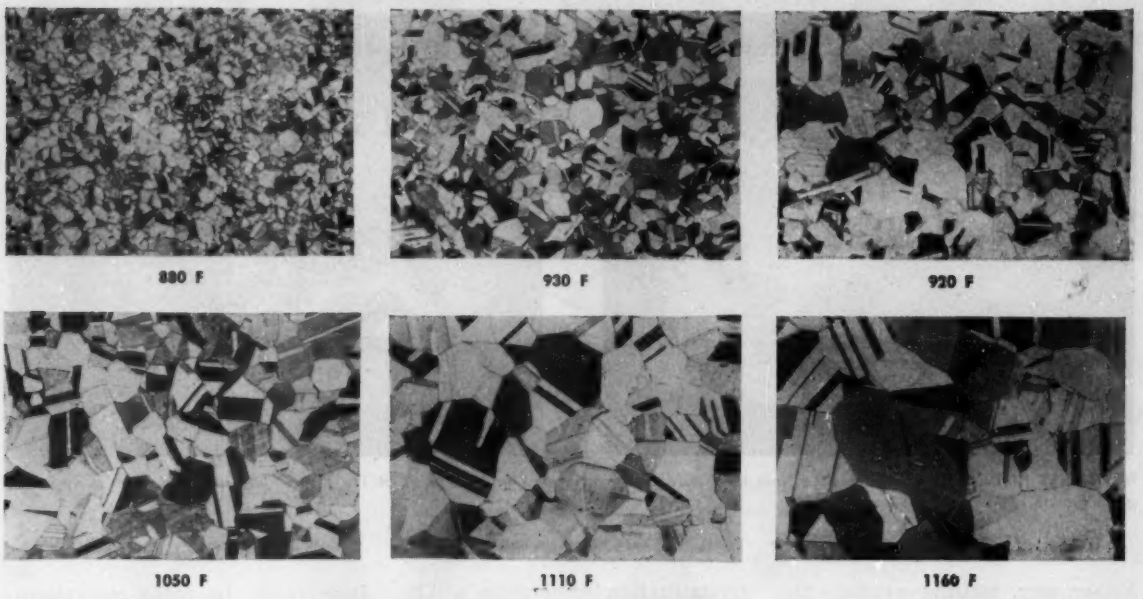
These new grains are not the same as the old grains. They are different in size, and the new grain boundaries are not located where the original grain boundaries were. In other words, there is a gross movement and change of the atoms caused by the cold-working and annealing processes.

With regard to the nucleation rate during recrystallization, the more nuclei we have, the more grains we will have, because each nucleus represents one grain. The fewer nuclei the fewer the grains and, therefore, the bigger the grains. Thus, if the properties of the metal being annealed depend on grain size, we want to control the rate at which these nuclei form; that is, the nucleation rate.

GRAIN GROWTH

If the metal is held at just the recrystallization temperature, it is composed of a mass of tiny equiaxed grains. If the temperature is raised above the recrystallization point, the tiny crystallites continue to grow. With no more cold-worked metal available, they now devour each other. In other words, the grains grow. A temperature increase is far more effective for causing grain growth than increasing the time at a particular temperature. Normally, a 20 F temperature rise is equivalent to doubling the holding time at the lower temperature. Theoretically, growth continues until the entire structure consists of just a few huge grains. However, excessive grain growth is not allowed in actual practice; it is impractical for the time involved and the reduction in strength.

When metal is in a completely softened, stress-relieved, and grain-restored condition, it is "completely annealed." It has its lowest strength, lowest hardness and highest elongation in this condition. Compared to the hard material it came from, its electrical resistance is lower, its magnetic properties are considerably changed and its resistance to attack by corroding media as well as etching reagents is considerably improved. Now the metal is ready for further



GRAIN SIZE coarsens rapidly with increase in annealing temperature. These six views show the effect on brass (70 copper-30 zinc). 75 X

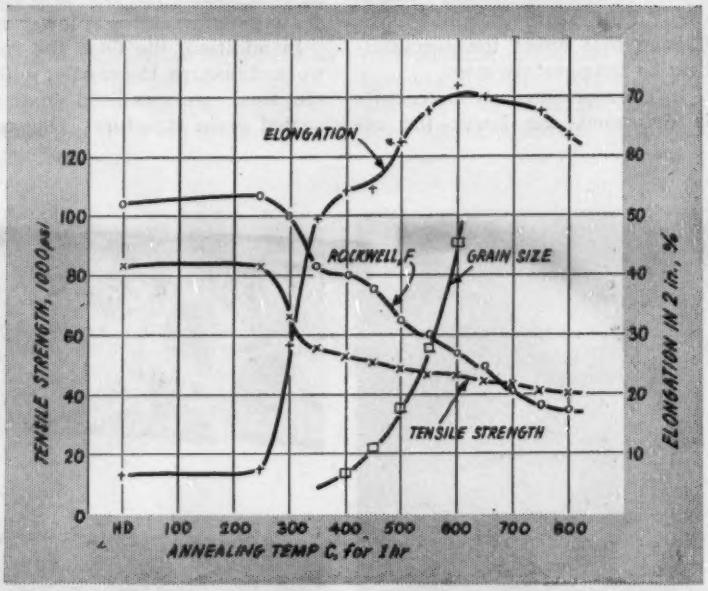
coldworking, or deformation. By repeated annealing the metallurgist is able to deform metals to desired shapes and sizes without rupture.

SECONDARY GRAIN GROWTH

With continued heating, we sometimes observe grains that are not of uniform size. The phenomenon causing heterogeneous grain size is termed secondary grain growth. The huge grains are developed by a sudden spontaneous growth that devours many of the little grains.

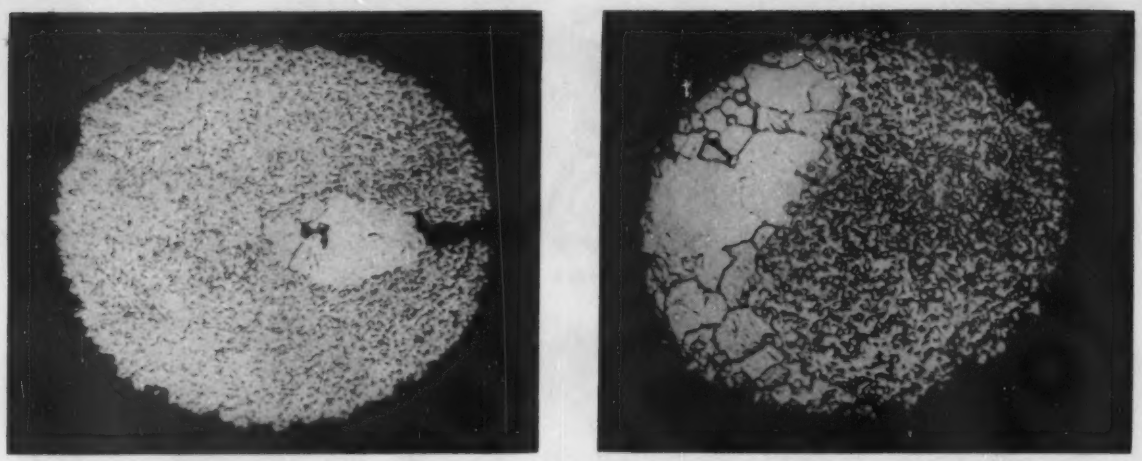
Basically, we do not want grain coarsening or secondary growth to occur, because with a fine-grained or a uniform-grained structure we have better and more uniform mechanical properties than with mixed grain structures. At times these mixed structures are referred to as "duplex structures."

Grain growth stops if a slight amount of melting occurs at the grain boundaries. Melting occurs because the annealing temperature is too high. Impurities rejected to the grain boundaries during solidification may melt, or a low-melting-point constituent at the grain boundaries may start to liquefy.



MARKED CHANGES IN PROPERTIES of brass occur with an increase in annealing temperature

Photomicrographs of copper alloys are reproduced from its *"Technical Handbook"*, by courtesy of the Bridgeport Brass Co.



BRITTLENESS IN TUNGSTEN WIRE resulted from the fissure and exaggerated grain growth at the fissure (left specimen) and exaggerated grain growth alone (right specimen)

Either way, melting weakens the bonds between the grains. Usually, partial melting is termed "burning."

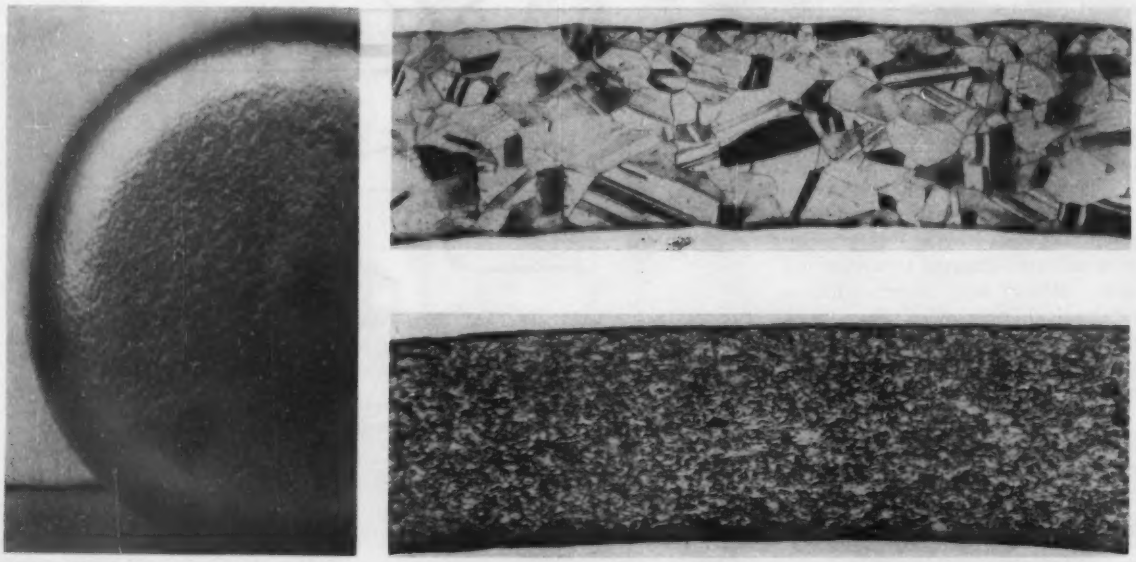
FACTORS AFFECTING RECRYSTALLIZATION

Recrystallization temperatures vary for different metals and alloys. Factors that affect the recrystallization temperature are:

1. The more severely a structure is deformed, the lower the recrystallization temperature will be. Thus, if high-purity copper is deformed 93%, it will recrystallize at 175 F, whereas the same metal deformed only 10% requires 430 F (Table I). This phenomenon has practical value. We can severely deform metals but use lower annealing temperatures at lower cost.

In addition, the finer the cold-worked texture, the smaller will be the final recrystallized and annealed grain structure. This is of importance in many operations. Finer grains means higher strength, better resistance to impacting and, in general, better mechanical properties. It is much easier for fracture to occur along the boundaries of a few large grains than through a metal composed of a large number of small grains.

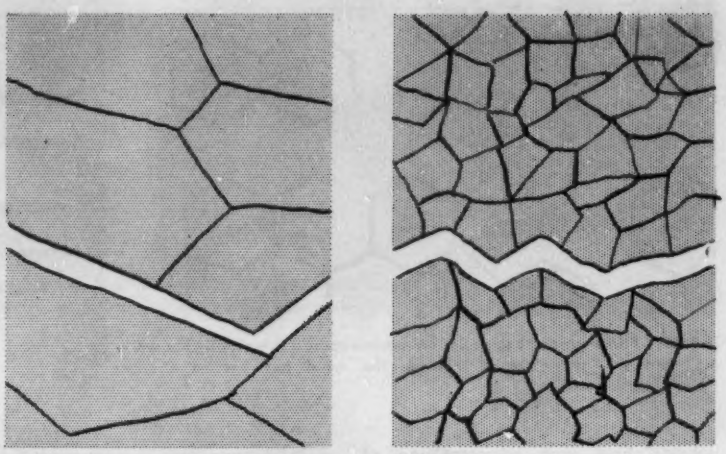
2. Chemical composition affects recrystallization and grain growth. We can deliberately add constituents to molten metal to surround,



"ORANGE PEEL," or a wrinkled finish, is the result of drawing over-annealed brass (excessively large grain structure). To avoid high polishing and buffing costs, articles should be made of fine-grain material. 75 X

table I . . **EFFECT OF COLD REDUCTION ON RECRYSTALLIZATION OF HIGH-PURITY COPPER**

Percent Reduction	Temp. F	Brinell Hardness
93	175	107
50	250	102
25	300	90
10	430	75
3	700	60



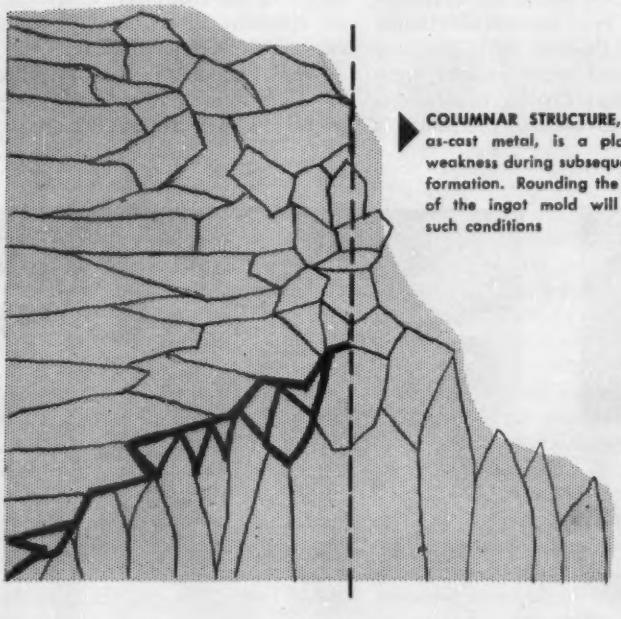
RUPTURE OF COARSE-GRAINED STRUCTURES is easier than for fine-grained ones, because the fracture lane is relatively straight

after solidification, the grain boundaries either as sub-microscopic or microscopic particles. These particles form a barrier to prevent expansion or growth of grains, until secondary grain growth is forced by very high temperatures.

Aluminum is added to steels for this reason. Also, insoluble copper oxide, CUO_2, forms in some of copper alloys, to restrict or inhibit grain growth. The smaller the particles, and also the greater number present, the finer will be the recrystallized grain size.

Chemical composition can also cause recrystallization to occur at lower or higher temperatures, by a change in the nucleation mechanism. Where we wish fine-grained structures that recrystallize at low temperature, then we must have an increase in the rate at which the nuclei form. If the contrary is desired, then we want a decrease in the rate at which nuclei form.

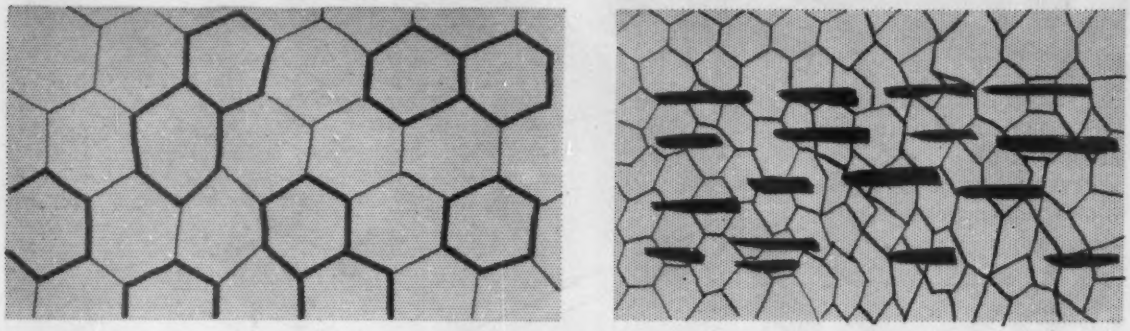
The higher the purity of metal the lower the recrystallization temperature. Minimum recrystallization temperature for high-purity copper is about 175 F, but for commercial, less pure copper it is about 390 F. Metals deliberately added to a molten metal or alloy when they go into solution generally raise the temperature of recrystallization and refine or minimize the grain size. Alloys of several metals like



COLUMNAR STRUCTURE, as in as-cast metal, is a plane of weakness during subsequent deformation. Rounding the corner of the ingot mold will avoid such conditions

table II . . **MINIMUM RECRYSTALLIZATION TEMPERATURES OF METALS**

Metal	Temp. F
Aluminum	300
Brass	480-930
Bronze	930
Copper	390
Aluminum Alloy	985
Iron and Soft Steel	840
Lead	Room Temp
Magnesium	Melting
Molybdenum	Melting
Nickel	1290
Steel, structural	1110
Steel, high carbon	1290
Tin	Room Temp
Tungsten	2190
Zinc	Room Temp



IMPURITY FILMS surrounding grains are broken up into stringers by hot working, and the grain size is reduced. The metal has become stronger

copper and zinc recrystallize at considerably higher temperatures than pure metals. For example, 5% zinc, 95% copper alloy will recrystallize about 400 F higher than copper.

3. Recrystallization is not much affected by the various types of working processes.

4. In some metals, particularly aluminum alloys, the rate of heating affects final grain size. The faster the rate of heating to annealing temperature, the finer will be the grains.

WARPAGE

Residual stresses in cold-worked metal are completely relieved if parts are uniformly annealed. Non-uniform cooling rates in different parts of the piece can distort it. The same is true if some structural change occurs within the material as it is cooled. Steel is a good example. If it is cooled too rapidly, all or part of the metal can change to a new phase, such as martensite. This sets up new stresses within the metal. Now the alloy requires special heat-treatment to relieve these new stresses. For steels this process is known as tempering.

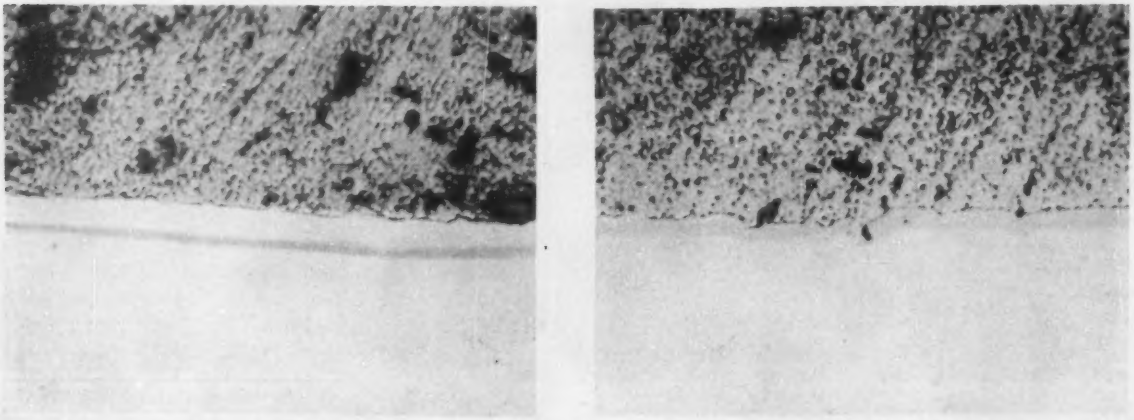
Thermal cooling stresses are not the same as stresses induced by cold working. By careful heat treatment or redesign, we can eliminate or minimize thermal stresses and accompanying distortion. Usually a slow cool is required to avoid excessive thermal stresses from being set up.

Examples of where thermal stresses can be set up are in sharp-cornered or narrow-sectioned materials. During cooling, these locations cool more rapidly than adjacent areas. Cooling causes contraction. The bulk of the metal is hot and contracts at a different rate. These different contraction rates are what cause stresses to be set up. Redesign to avoid sharp corners or to make thin sections thicker and vice versa, will usually hinder the introduction of cooling stresses.

ATOM ALIGNMENT

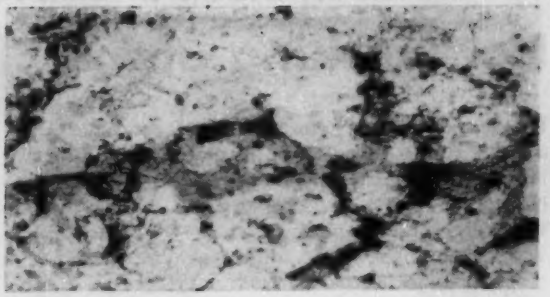
In *AM* Special Reports 345 and 372, the alignment of atoms within metals was discussed. We learned that by cold deformation the planes of atoms composing the metals align themselves in specific directions — the metal shows a preferred orientation. We also learned that preferred orientation causes metal to have different properties in different directions. In some cases, this is objectionable.

What happens during annealing of cold-deformed metals? Does preferred orientation disappear?

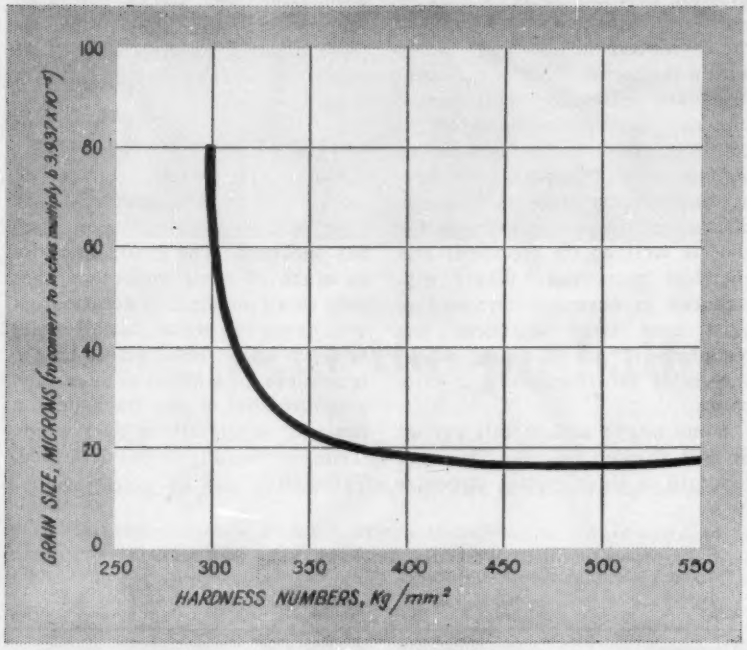


PRESSURE is sometimes significant in a hot-working operation. When aluminum was bonded to nickel at 22,000 psi, two aluminum nickel alloy zones formed (left), whereas with 40,000 psi (right) only one zone formed, and the dark alloy zone was avoided

INTERCRYSTALLINE CRACKS may develop when heated alloys are struck a sharp blow. Crack at right developed in brass when worked at black heat. 75 X



CRACKING OCCURRED during swaging of 50 tungsten-50 molybdenum. Failure again is seen at the grain boundaries. 250 X



HARDNESS of heat-treated steel increases rapidly as the grain size decreases. Grain size is important in annealed structures too, because the properties of the metal being annealed may depend upon the grain size

Does it remain the same or does it change? Many metallurgists erroneously believe that preferred orientation is made random by annealing; ie, the mechanical properties are the same in all directions. What happens is that preferred orientation continues to exist; but is changed to a new direction by annealing.

We cannot eliminate or reduce the effect of preferred orientation by annealing. The only way we can do it is by avoiding excessive deformation in the cold state, specifically by cross rolling.

In cold-worked sheet, the mechanical properties are different in the longitudinal and transverse directions. Generally, the longitudinal direction has the higher properties. This effect carries over into the annealed state.

Forgings of non-uniform size have different grain sizes at various locations. This comes about from the fact that different amounts of deformation went into making the structure. When something is severely deformed locally, we have localized areas of greater fragmentation of the grains, and thus finer grain sizes in these locations. When we anneal, we can expect finer grain sizes at similar locations, and where less severe deformation occurred we have larger grains. This leads to variation of properties within annealed pieces, because the properties are dependent upon the grain size.

Exaggerated grain growth occurs in silicon steels and high-chromium steels upon annealing. Iron-chromium-aluminum, heat-resisting alloys also tend to develop excessively large grains. In this condition, this alloy is weak.

Hot working of metals

Hot working is the deformation of a metal above its recrystallization temperature. Little or no strain hardening occurs. Thus, almost all the deformation energy is converted into heat. It is important that hot-working be carried out carefully, because it is possible to overheat a piece of metal being formed. This in turn, can cause weakening or even partial melting and subsequent bursting of the metal.

Metals are hot worked for a number of good reasons. First, as a metal is heated it becomes plastic or much more easily deformed. The forces holding the planes or rows of atoms making up the metal are reduced. They can slip past one another more readily. Larger pieces of material can be deformed because the metal is soft. In other words, we can work with big ingots. In addition, less power is required to deform heated metals.

EFFECT OF TEMPERATURE

The higher the temperature the more readily are metals deformed. The only possible exception would be reversion or conversion to another crystal structure at higher temperatures. For example: as low-carbon steel alloys are heated from room temperatures to about 1350 F, the structure softens. Above this temperature and up to about 2600 F, the structure suddenly becomes more plastic, because the atoms have rearranged themselves to a new and more easily deformed configuration. See *AM* Special Report No. 332.

What are the effects of hot working on the properties of metals? For one thing, any detrimental impurities in casing grains are readily broken up. The shells are dragged out into less objectionable stringers. True, the stringers cause lower strength values in the transverse direction, but the grain size of the material is refined and we have greater strength.

Often the as-cast grain structure is unsuitable for cold deformation. The grains freeze out of the molten metal in parallel columns — the columnar structure. Where one group of columnar grains meets another group in an ingot, the location is mechanically weaker than the rest of the ingot. Cold deformation and even at times hot deformation can cause rupture of the metal along the columnar grain meeting sites, or planes of weakness. However, we can often eliminate the detrimental as-cast structure by hot working, and put the metal in a better condition for cold working at a later stage.

Hot working encourages more rapid movement of the atoms within the metal. That is, diffusion rates are increased. This means that any localized areas of segregation in alloys are evened out or homogenized. This aids in improving and making more uniform the mechanical properties of the material as well as its electrical and chemical properties. Where differences in chemical composition exist over large distances, the technique of hot working is not successful for homogenizing purposes.

Some alloys and metals cannot be cold worked readily. They are too hard or their crystal structure doesn't allow for cold deformation. They break up during any attempts to work them at room temperature or below their recrystallization temperatures.

Normally, we try to finish hot working at just the recrystallization temperature of the metal. Usually, the exterior temperature of the metal is used as the guide. If hot working finishes up above the recrystallization temperature, the grains are large and the tensile strength is low. If the working process is finished below the recrystallization temperature, hardening occurs and the metal can crack.

FAILURE AT HIGH TEMPERATURES

Metals can also fail during hot working if the temperature is too high and no melting or burning has occurred. The grains can lose so much of their coherency that only small amounts of deformation will cause the metal to fall apart or crack open. Thus we see that it is possible for a metal to be of such a nature that it can have only a *range of temperatures* over which it can successfully be hot deformed, Table III.

table III **. . HOT-WORKING TEMPERATURES FOR METALS**

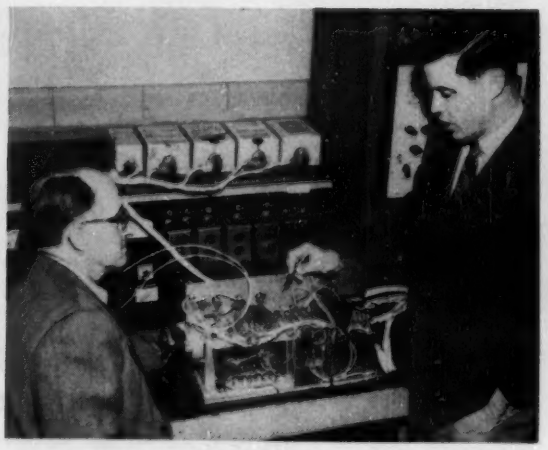
Metal	Hot Working Range, F	Range Causing Failure, F	Softening Temp, F (½ hr at temp)
Aluminum	800-850	1000 and up	300-660
Brass	cold	1100 and up	480-930
Bronze	cold	—	—
Copper	1380-1470	1470 and up	750-1290
Aluminum Alloy	660-840	can be worked cold 45 min after heat treatment	985
Iron and soft steel	1650-2000	650-1650	210-1700
Lead	cold	none	—
Magnesium	570-790	790 and up	—
Monel	1650-2100	1000-1600	1560-1830
Nickel	2000-2200	1000-1600	1300-1650
18-8 stainless steel	1750-2300	—	1650
Steel, structural	1760-2000	650-1650	1550-1650
Steel, high carbon	1300-2000	650-1300	480-1300
Tin	cold	400	200-300
Tungsten	1100-2900	cold	—
Zinc	230-300	500	150-300

▶ **TEARDOWN IN THE SHOP** fulfills many a man's dream — to take a pinball machine apart. Upturned panel (rear) shows several counters reclaimed for lab use

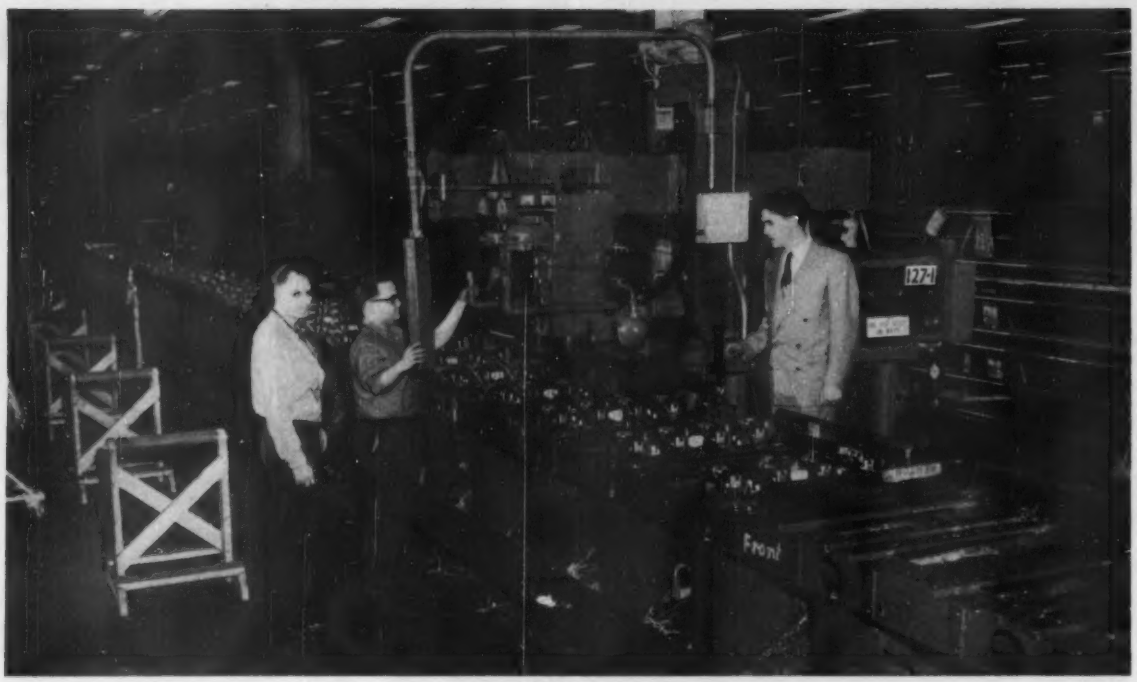
Boeing beat the pinball game

Seized by state and county authorities as gambling devices, 92 "one-armed bandits" went to Boeing Airplane Co for a $1408 bid. Out of them a total of $9200 worth of electrical parts — motors, switches, relays, transformers — were salvaged to go into laboratory test equipment that checks operation of components for B-47 bombers

FOUR COUNTERS AND TRANSFORMER from junked machine check the number of flexes airplane springs will take before breaking. Four reclaimed relays are also used



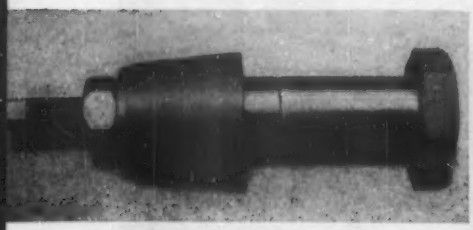
LIFETIME CYCLE TESTS ON ANTI-SKID RELAYS for B-47 (on shelf) are tested in a pinball rig made with relays, contacts, and transformers (foreground)



B-52 wing stiffeners . . .

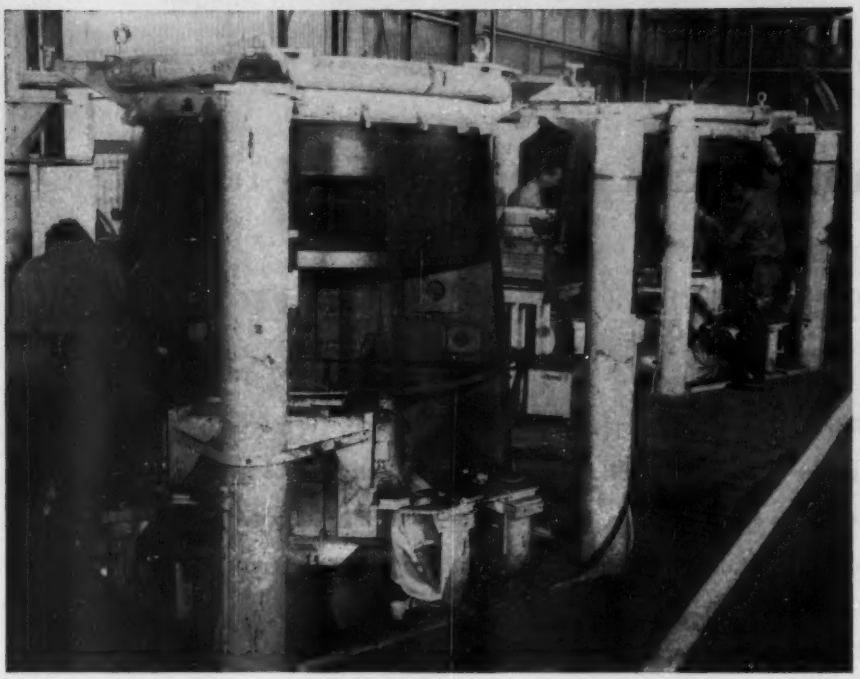
. . . will be produced with a new 100-ft open-side drill and router, designed by Boeing and built for $80,000. Drill and router units are separate, but ride on same ways. Table is 3 ft wide and in five removable sections. Burg Tool Mfg Co designed and built turret drill to Boeing specs; Western Gear Wks made drill carriage unit; remainder was constructed in Boeing shops. Another unit will go to Boeing's Kansas plant. *Boeing Airplane Co, Renton, Wash*

in aircraft production



Wing bolts for the supersonic Convair F-102 interceptor . . .

. . . hold the wing and fuselage tightly together, and therefore must be inserted into close-fitting holes in the wing root. Latest method replaces hammering, which was hard work and chanced damage to parts; consists of using bolt puller. Necked-down extension is pushed through root hole, screwed to bolt end, then shoulder block, washer, and nut are added and nut tightened with wrench. This pulls bolt smoothly through hole. Only change necessary was to alter pitch of bolt threads slightly. *Consolidated Vultee Aircraft Co, San Diego, Calif*



Pit-mounted jig for forward fuselage . . .

. . . of F-89D simplifies multi-level fabrication and assembly. Northrup's Scorpion line is only 550 ft long, with 11 final-assembly stations, claimed faster in flow and more economical than long line. *Northrup Aircraft, Inc, Hawthorne, Calif*

Die handler makes it easier . . .

. . . to iron out hydro-pressure wrinkles with mallets and bars by allowing 360° rotation and die opening to admit new parts without taking dies from the vise. Operator's left hand is on T-clamp that lets unit rotate; right hand is on DeStaCo clamp that locks parts into die set. Support is partly angle iron welded up to support the steel platforms that hold the dies. Unit is clamped on regular table vise. Several were made to different sizes at average cost of $50. *Temco Aircraft Corp, Dallas,*

Half-shell fuselages for F-89D Scorpions . . .

. . . move on two sides of central work area as electrical, pneumatic, and hydraulic equipment is assembled. Fuselage halves are joined in "sew-up" fixture later, then go to another fuselage line where external additions are made. *Northrup Aircraft, Inc, Hawthorne, Calif*

How to calculate exact wheel profiles for

Form grinding helical-gear teeth

To form grind or form mill the teeth of helical gears, you must determine in advance the special curved profile on the wheel or cutter. This article derives the formulas for computing the coordinates, pressure angle and radius of curvature of the cutter form. Then by a numerical example, it shows you how to use the computed data in establishing the settings of the radius-dressing fixture

OLIVER SAARI, development engineer, ILLINOIS TOOL WORKS, INC

The teeth of nearly all helical gears are based on the involute-helicoidal form. Gears are most often manufactured with roll-generating tools, such as hobs, shaper-cutters, and flat-sided grinding wheels —where the ease of maintaining accurate forms on such tools is of prime importance. Sometimes, however, it is more convenient to mill or form-grind gear teeth, in which case the special curved profile of the cutter or grinding wheel must be determined in advance.

For spur gears the grinding wheel is dressed to the true involute or any desired modification thereof, because it reproduces its form exactly on the work. In form-grinding helical gear teeth, however, the phenomenon known as "helical interference" enters the picture. Here, the exact wheel profile is not reproduced anywhere on the work. The purpose of this article is to show how the correct wheel-dressing profile, as well as its radius of curvature at any point, can be calculated by an exact mathematical method.

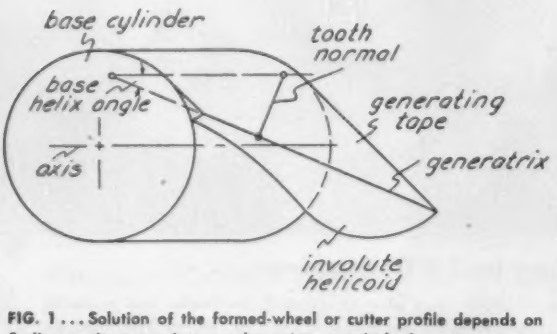


FIG. 1 . . . Solution of the formed-wheel or cutter profile depends on finding conjugate points, or the points at which the cutter (a surface of revolution) can be tangent to the involute helicoid

An involute helicoid can be thought of as the surface generated by the end of a taut tape unwinding from a cylinder, Fig. 1. If the end of the tape is square, the surface generated is similar to the tooth forms of spur gears. If the end is cut at an angle, the generated surface is an involute-helicoid similar to the teeth of helical gears and involute worms. The angle at which the generating tape is cut is called the *base helix angle*, and the cylinder from which it rolls is called the *base cylinder*. Obviously the cross-section of the involute in the plane of the generating tape is a straight line; moreover, all surface normals of the involute-helicoid along this cross-section lie in this plane and are therefore tangent to the base cylinder. These properties make the solution for the cutter profile easier than it might otherwise be.

Some knowledge of the derivation of the formulas will be helpful in using them. Fig. 2 shows, in three views, the relationship of the cutter to the work. The work is located in an x-y-z coordinate system with its axis on the x-axis. The cutter axis is located an arbitrary distance C and angle a from the gear axis, with the pivot-line (or common normal between the axes along which C is measured) coinciding with the y-axis.

The solution depends on finding *conjugate points*, or points at which the cutter (a surface of revolution) can be tangent to the given involute-helicoid. The calculations are much simplified if carried out in terms of the independent variable parameter Ω, defined in the side view of Fig. 2. Variations in Ω sweep the end of the generating tape across the

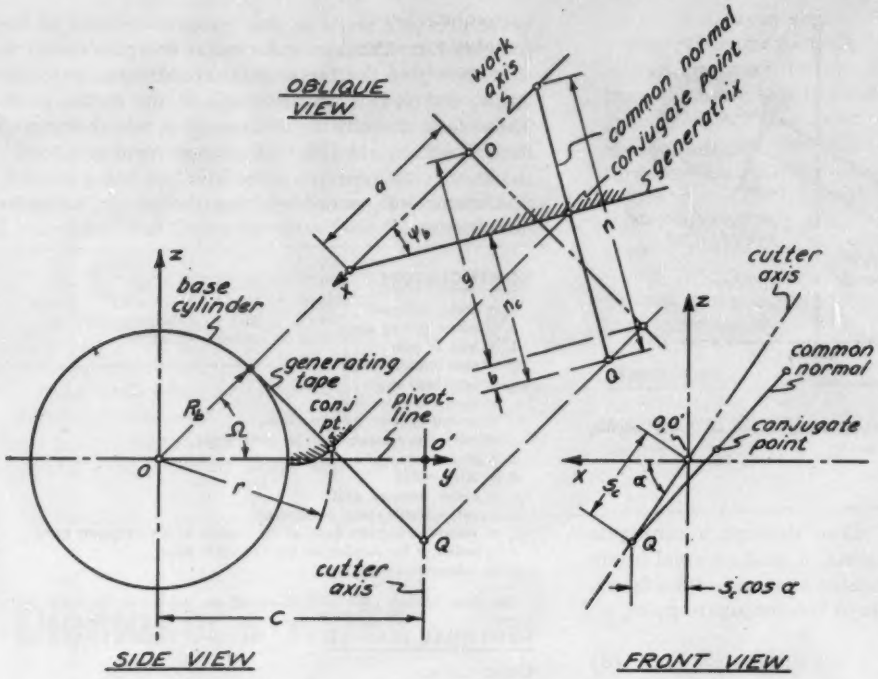


FIG. 2...Parameter Ω, side view, is the variable upon which the calculations are based. One conjugate point is found for each value of Ω, and the locus of several points is the true contact line between the formed wheel or cutter profile and the involute helicoid

entire involute-helicoid. In general, one conjugate point can be found for every choice of Ω. The locus of points obtained from a series of values of Ω is the true contact line between the cutter and the involute-helicoid.

The conjugate point is found by applying the following facts: (a) Two surfaces which are tangent must have a common normal. (b) In the plane cross-section of the involute-helicoid shown in the oblique view, Fig. 2, all normals are in the plane of the generating tape and are perpendicular to the generatrix. (c) All normals to the cutter surface must pass through the cutter axis.

From these considerations it is obvious that the common normal must pass through the point at which the cutter axis intersects the plane of the generating tape, or point Q in Fig. 2. This point is easy to find by analytic geometry. The remaining symbols shown in Fig. 2 are to aid in finding the conjugate point by triangulation.

The distance s_c, measured from point O' along the cutter axis, locates the point at which the plane of the generating tape intersects the cutter axis.

$$s_c = \frac{C \cos \Omega - R_b}{\sin a \sin \Omega} \quad \ldots\ldots (1)$$

The distance n is the length of the common normal from its point of tangency to the base circle to its intersection with the cutter axis.

$$n = \frac{C - R_b \cos \Omega}{\cos \psi_b \sin \Omega} \quad \ldots\ldots (2)$$

The distance n_c is that portion of the common normal which extends from the conjugate point to the cutter axis.

$$n_c = g - a \sin \psi_b + b \quad \ldots\ldots (3)$$

Here the actual values of the intermediate quantities a, b, and g (defined in Fig. 2) can be obtained from given data as follows:

The value of a depends on the position of the involute-helicoid with respect to the centerline. Usually the cutter is pivoted about the center of the tooth space of the gear, so that its profiles are symmetrical and only one side needs to be computed. In this case, if B is one half the axial base space width, then

$$a = \frac{L}{2\pi} \text{ arc } \Omega - B \quad \ldots\ldots (4)$$

where B may be determined by methods well known to gear geometers. A convenient formula in terms of the usually-known tooth-proportion is

$$B = \frac{\frac{1}{2}(p_n - T_n) - R \text{ inv } \phi \cos \psi}{\sin \psi} \quad \ldots\ldots (5)$$

If the pivot line is not symmetrically located, then B must be computed as the distance from the pivot line to the start of the exvolute in the x-y plane, and since its value will be different for the two sides of the tooth space, different cutter profiles will result. B is positive to the right of the centerline (opposite to the sense of x).

Trigonometry gives the value of g as

$$g = n \cos^2 \psi_b \quad \ldots\ldots (6)$$

and also

$$b = s_c \cos a \sin \psi_b \quad \ldots\ldots (7)$$

Fig. 3 shows an axial cross-section of the cutter or

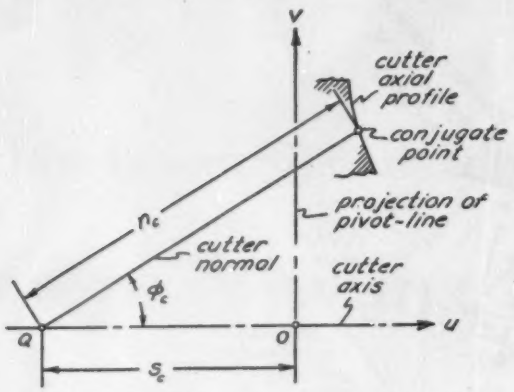


FIG. 3 ... Axial cross-section of grinding-wheel or cutter profile, as taken through a conjugate point

grinding wheel profile, taken through a conjugate point. Thus the cutter normal n_c and its axial intercept s_c are in the plane, related as shown in the figure. The cutter pressure angle at the conjugate point, ϕ_c, is given by

$$\cos \phi_c = \sin \psi_b \cos a + \cos \psi_b \sin a \cos \Omega \quad \ldots (8)$$

The coordinates u-v, used to define the cutter axial profile as shown in Fig. 3, are given by

$$u = n_c \cos \phi_c - s_c \quad \ldots (9)$$

$$v = n_c \sin \phi_c \quad \ldots (10)$$

The equations (1) through (10) represent the solution for the rectangular coordinates of the cutter profile. Substitution of different values of Ω into these equations yields a series of points on the cutter axial profile.

Sometimes it is necessary to determine the radius from the involute axis corresponding to a particular conjugate point. This must be at least approximate at the top and bottom of the tooth form to make sure the cutter form is long enough to finish the entire tooth. If r is the radius of the involute to the conjugate point, and ϕ_t is the transverse pressure angle of the involute at this point, then

$$\tan \phi_t = \frac{(n - n_c) \cos \psi_b}{R_b} \quad \ldots (11)$$

$$r = R_b \sec \phi_t \quad \ldots (12)$$

Sometimes it is convenient and sufficiently accurate to approximate the profile of a cutter of this type with an arc of a circle. This is especially helpful in dressing a grinding wheel. The exact radius of curvature, ρ, of the cutter profile at any conjugate point is given by

$$\rho = \frac{n \sin^2 \phi_c}{(\sin a \sin \Omega)^2} - n_c \quad \ldots (13)$$

The actual radius used in dressing the grinding wheel should be the radius of curvature at a point somewhere near the center of the cutter form. The location of course depends on the choice of the parameter Ω. In general the best choice of radius will result from an Ω slightly greater than the transverse pressure angle of the involute-helicoid at the pitch radius. The above formulas are convenient in that they give the rectangular coordinates, pressure angle, and radius of curvature of the cutter form. These lead directly to settings of a wheel-dressing fixture which will result in correct form and tooth-thickness relationships on the involute being ground.

A numerical example using the above formulas now follows.

NOMENCLATURE

- C = center distance
- a = cutter setting angle
- L = lead of gear
- R_b = base cylinder radius
- ψ_b = base helix angle
- p_n = normal circular pitch
- T_n = normal circular tooth-thickness
- ϕ = transverse pressure angle at pitch circle
- ψ = pitch helix angle
- R = pitch radius
- ϕ_c = cutter pressure angle
- ρ = cutter profile radius of curvature
- ϕ_t = transverse pressure angle of the involute at any conjugate point
- r = radius of the involute at any conjugate point
- Ω = independent variable

The other symbols used in the formulas are defined in the text.

NUMERICAL EXAMPLE

Gear data:

No. of teeth = 10
Normal diametral pitch = 1
Normal pressure angle = 20°
Pitch helix angle = 60° = ψ
Pitch radius = 10.000 = R
Nor. circ. tooth thickness = 1.5708 = T_n

Cutter data:

Setting angle = 30° = a
Approximate cutter diameter = 10 in. at pitch line
Therefore let C = 15.000 in.
Pivot line on tooth-space centerline

Solution:

Step 1. From the given gear data obtain the following:

p_n = 3.14159
ϕ = 36.0524 deg.
R_b = 8.08479 in.
B = 0.33701 in. (from Eq. 5)

Step 2. Choose a set of value of Ω. In general, the point determined by setting Ω equal to the transverse pressure angle ϕ is somewhere on the cutter form between the middle and the O.D. In this case values of Ω = 30°, 36.0524°, 40° and 45° will be used. For example, when Ω = 30°,

s_c = 19.62236 (from Eq. 1)
n = 27.52608 (from Eq. 2)
n_c = 20.93986 (from Eq. 3, 4, 6, and 7)
ϕ_c = 16.9786 (from Eq. 8)
u = 0.4048 (from Eq. 9)
v = 6.1147 (from Eq. 10)

This point is seen to be near the tip of the cutter tooth, corresponding to a point on the gear tooth near the root.

r = 8.9451 (from Eqs. 11 and 12)
ρ = 16.6155 (from Eq. 13)

This point is too near the bottom of the involute form for the ρ to be a good cutter approximation, and the calculation was carried out here only for purposes of illustration. Values obtained for other choices of Ω are given in Table I.

Table I . . . Calculated Coordinates, Pressure Angles and Radii of Cutter Form for Four Parameters Ω

Ω	u	v	ϕ_p	ρ	r
30°	0.4048	6.1147	16.9786°	16.6155	8.9451
36.0524	0.6935	5.2524	20.0000°	18.0731	9.7537
40°	0.9252	4.6489	21.9727°	19.5279	10.3612
45°	1.2784	3.8264	24.4620°	21.7481	11.2052

Note that when Ω is made equal to the transverse pressure angle of the involute, ϕ_c is equal to the normal pressure angle of the involute. This is the special case correctly dealt with in Ref. 1.

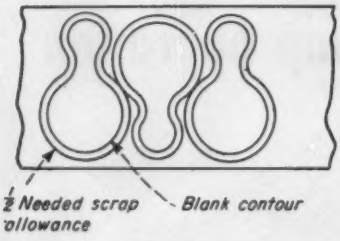
The value of r at the pitch point of the gear is, of course, the pitch radius, or 10 in. By interpolation from the table it is found that letting $\Omega = 38°$ gives approximately this value, and thus should be used in computing the settings of the radius-dressing fixture. In this case the settings come out to be $u = 0.8030$, $v = 4.9594$, $\rho = 18.7529$ and $\phi_c = 20.974$ deg. Use of this radius gives an involute form which is approximately 0.0015 in. "minus" at the root and 0.0015 in. "plus" at the tip. If greater accuracy is desired composite radii or exact templet dressing should be used.

REFERENCES

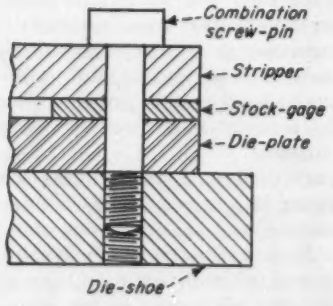
1. *Wildhaber, E, "Cutter Shapes for Milled and Ground Threads," American Machinist, May 1, 1924*
2. *Tuplin, W, "Form Grinding of Worm Threads," Machinery, December, 1952*
3. *Merritt, H, "Gears," Pitman, Ltd, First Edition, 1942*

Diemaker's Kinks

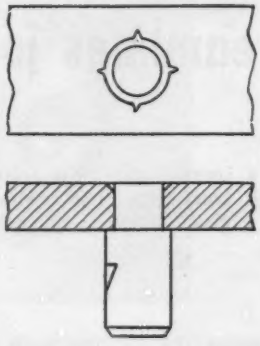
FEDERICO STRASSER



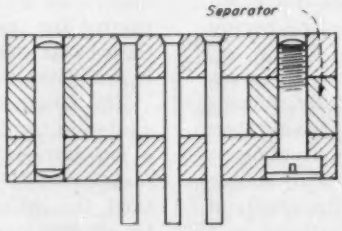
LAYOUT of scrap strips is aided by use of three templets having one-half the scrap allowance or "bridge" all around. By manipulating the templets, side by side, the most economical layout will be found. Be sure that allowance at the edge of the strip is satisfactory.



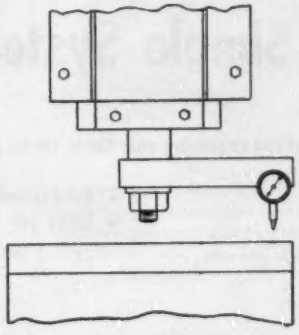
COMBINATION screw-dowel pins are necessary when space is limited in small dies, jigs and fixtures. The shoulder screw has a cylindrical body ground for proper fit in the members of the tool.



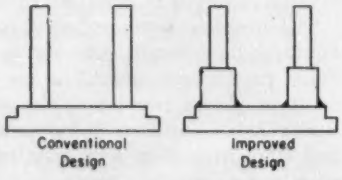
WHEN SECURING quick - change punch-holders in a punch plate, chamfer the hole in the plate, so that the end of the holder can be riveted over. Also, stake the rivet head at several points so that the punch-holder cannot turn in the plate.



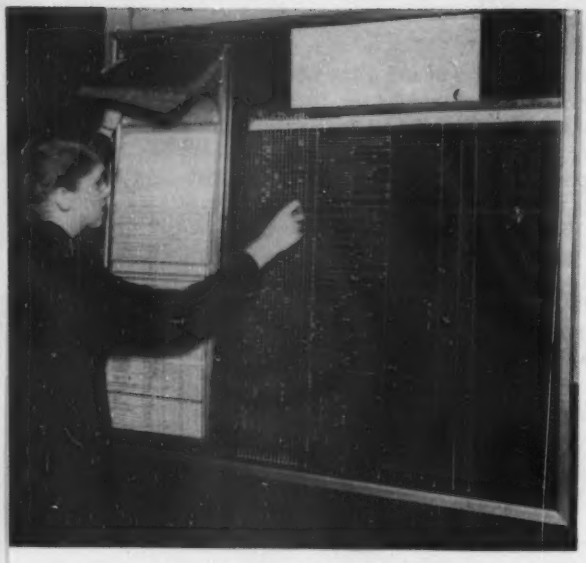
LONG SLENDER punches are best held with two punch-holder plates and separators, instead of by one thick plate. When the punches are sharpened, the separators are ground the same amount.

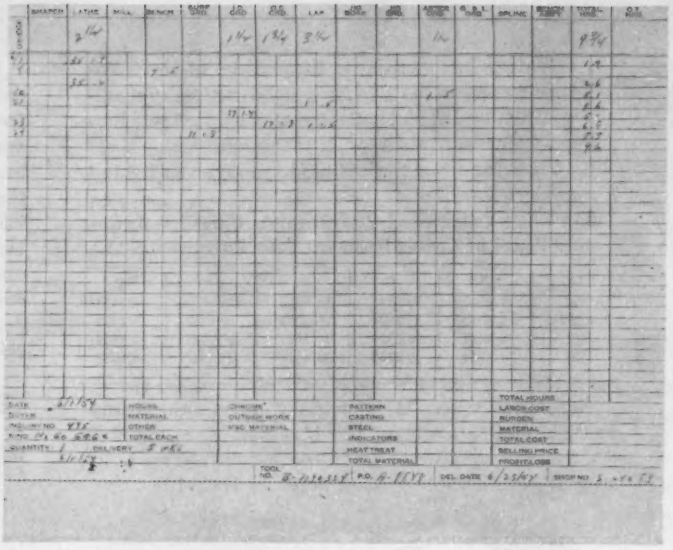


PRESS ALIGNMENT can be checked by making a round shank to fit the press ram like a punch shank, and mounting a sweep arm on the shank. To the sweep arm fasten a dial indicator. With an accurately made inspection device, you can check alignment of the ram to the bolster or bed and make corresponding adjustments.



TO INCREASE rigidity of diesets, it is possible in some applications to weld bosses to give better support to the guide posts. In effect the guide posts are shortened by the length of the bosses.





COMPLETE VISUAL INFORMATION on every job in the shop is quickly available on this board where Job Cards and colored buttons show hours spent on each operation compared with estimated time, stage of completion and date delivery is due.

Simple System streamlines job-shop operation

Method requiring only three forms provides:

- **Production control**
- **Daily job cost**
- **Location of work in process**
- **Exact stage of completion**
- **Visual record of delivery status**

GEORGE H DeGROAT,
associate editor

A problem common to most contract jobbing shops is the troublesome and costly one of keeping track of numerous short-run jobs. This involves calculating actual costs compared with estimated costs, quickly locating a particular job in process and determining where it stands relative to a promised delivery date, its stage of completion, and other information often needed on a minute's notice. Sometimes complicated systems are set up and, despite the fact that overhead costs are increased thereby, full time attention of at least one person is often required to maintain them.

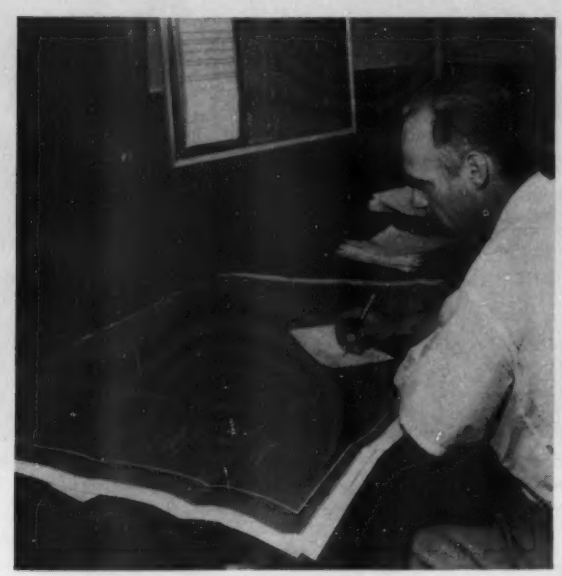
The problem becomes more complex with larger numbers of different jobs and is especially difficult when production quantities are down around two or three pieces per job. This was the situation at Amco Gage Co in Detroit before an extremely simple and efficient system was installed. Spline plug and ring gages, master gears, indicator fixtures, and other precision tools are made to customers' specifications in this plant, usually in quantities of 1, 2 or 3 parts. Considerable time was spent in gathering essential facts about each job every day and, of course, to provide good service to customers, it was necessary to devote considerable time to the needs of their expediters.

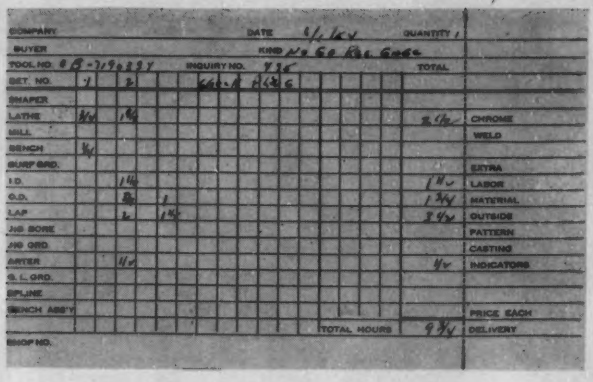
THREE-CARD SYSTEM

Conventional estimating procedure is employed in that such information as the sequence of operations, time required for each one, materials, tools, finishes, and costs are determined from customer's prints. The new system begins at this point, however, since all this data is listed on "Quote" cards printed for the purpose. Total cost is projected on these cards after which a quotation and delivery date is submitted to the customer.

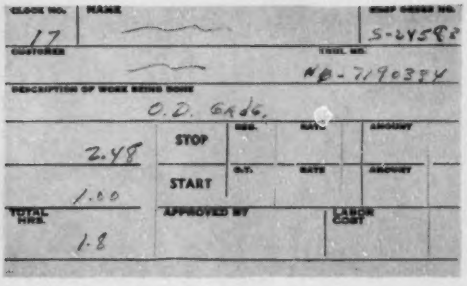
The Quote cards are filed with the request for quotation until the order is received at which time a job number is assigned and the estimated data transferred to a "Job" card. Similar to the Quote card, the Job card is printed with columns headed by all operations normally performed in the shop. Each column, however, is divided so that estimated time can be entered at the left under a given operation, and later, actual time posted at the right.

The job card also has columns headed total hours, overtime hours and has spaces for labor and ma-





FIRST STEP IN SYSTEM is to enter tools, finishes, operations, estimated time, etc. on Quote cards, working from print of part. When order is received a Job Card containing this data is installed on Produc-Trol board.



ACTUAL TIME SPENT on each operation is posted daily on Job Cards from special Time Cards which operators punch at start and end of operation. Time required to make these entries and bring the board up to date requires only spare time of one girl.

terial costs as well as total cost and selling price. Tool numbers, purchase order number, delivery date, and the shop number assigned the particular job are also entered.

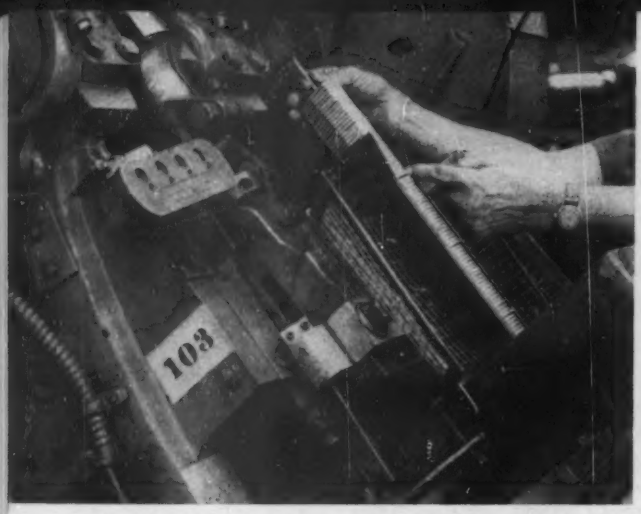
The Job card is installed in a Produc-trol board divided into columns headed by shop operations corresponding to those on the card. These columns are followed by others that indicate percent a job is complete, and date delivery is required.

A column indicating the current month in which work is in progress is bounded by two vertical white cords. Between them is a yellow cord which is moved daily to act as a daily calendar. In the horizontal direction are cords with colored buttons in line with the job cards. These are pegged into the board in a column having the heading of the particular operation being performed. Yellow buttons are used if the time spent on the operation is within estimated time and pink buttons if time has gone over. Red buttons in line with the job card are located under the date on which delivery is due. White buttons with progressive numbers corresponding to numbers on the job cards are moved to percent-complete positions.

Daily entries are made on the Job card by a girl who combines this work with other, more time-consuming, duties, as no more than one hour is usually required to collect the data and adjust the board. Data for the entries are provided from job "Time Cards" which each operator in the shop turns in at the end of the day. His name and clock number, the customer's name, the shop order number, and the operation to be performed are filled in before starting an operation.

The operator punches this card when he starts and stops so that a record of actual daily time is provided for each operation on every job. These cards are checked against regular time cards to be certain that total hours worked in a given day agree with total hours shown for various operations.

Quick service is given customers who may wish to know how their work is coming by simply looking at the board and checking the percent complete columns compared with current data and due date for a particular job. Greatest advantage, however, is the ease with which losses or gains can be established for each operation and each job.



DANGER TO OPERATOR was eliminated with magazine feed and wire guard added to press for forming plate clamps. Production now averages 30,000 per 8-hr day. With previous hand-feed setup, production rate was only 11,000 per day

LONG-HANDLED SPRAY OILER now used to lubricate blanking die for 30 x 30-in. plates does job in one-third the time required when a brush was used—and operator's hands are safe

Personal interest and guards...

Cut accidents, boost

Safety measures like those shown here reduced machine accidents and at the same time increased production more than a third

Despite the many potentially hazardous operations involved in the production of standard metal forms used by building contractors in the fabrication of poured concrete structures, Economy Form Corp has achieved an enviable safety record. This record has been made possible chiefly by (1) developing and maintaining a constant personal interest in safe working practices on the part of our employees, and (2) the proper guarding of the punch presses and other inherently dangerous production equipment used in the plant.

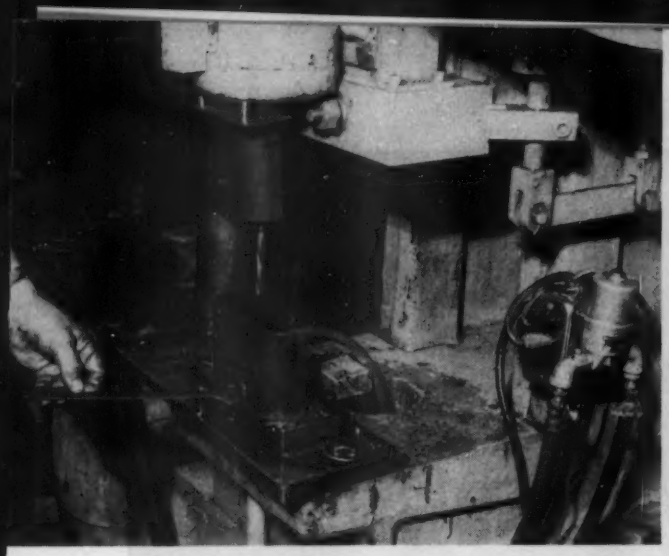
The standard metal forms consist of 30x30-in. steel plates with flanges on all four sides for clamping them to other similar plates, as well as reinforcing ribs that help prevent buckling of the plates when in use. Some 400 parts are stamped, shaped and formed, then welded to the plates in making up the standard assembly. We also make the hooks, clamps and grillwork which strengthen the forms so they will retain the enormous weight of freshly-poured concrete.

Production problems are further complicated by the operation of a separate department for cleaning, repairing and rewelding, and repainting of used forms returned to us for salvage.

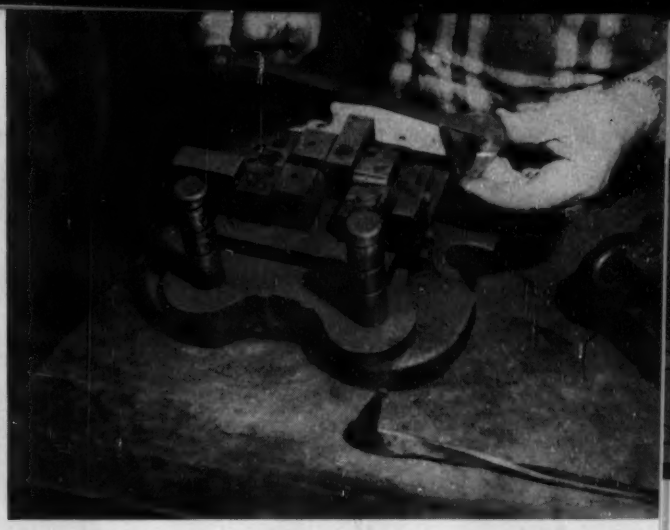
Our safety record has been possible only because of the personal interest our employees take in their own and their fellow workers' safety. In this, we have had the full support of our local union. They appoint three members of the safety committee every year —one from each department. The men chosen are selected on the basis of their reputation for being steady, reliable workmen whose advice and suggestions will be taken in good part by their fellow workers. We have found that their personal interest and example has been much more effective than would a more formal safety program.

Safety rules are few. All employees now wear safety goggles at their work. This has done away with most of the old eye-injury hazards that caused much lost-time in years past. In addition, all employees are requsted to wear safety shoes. Today, most of them do. The only punishment for not wearing safety shoes is an occasional list of non-wearers on the bulletin board. This list keeps getting shorter as a foot accident now and then acts as a spur to persuade more workers to wear approved shoes.

Because so much of our work is done on potentially-hazardous presses and forming machines, we have devoted a lot of attention to improved methods



GUARD AROUND REAMING JIG permits fast finishing of holes in ends of form hooks without danger to operator. When hook is in position, it strikes control arm of limit switch to start automatic cycle of machine through solenoid valve at right



BEFORE: Form hooks were twisted 90° in press die, requiring hand feeding to position hooks properly. Production rate was low, because operator had to be very careful

AFTER: Hooks are twisted quickly in air-actuated fixture. Operator drops hook into slots of fixed and twisting heads, then opens valve controlling the two air cylinders

production

C L MORGAN, plant superintendent,
ECONOMY FORMS CORPORATION, DES MOINES

for guarding these machines. It was not always easy to get the operators of these machines to make full use of these guards at first. Some of the older workers, who learned their trade on unguarded machines, couldn't quite see the need for better guards. They often protested that these guards would cut their production. We have all been surprised at the extent to which our guarding program has had the opposite effect.

Not only have we reduced machine accidents materially, but we have achieved an increase in production of one-third or more by the safety measures we have taken. We attribute this result to a great degree to the fact that the machine operator who can work without fear of hazard works more rapidly with greater confidence.

In our machine-guarding program we have received very valuable help from Ira Kiser, safety engineer, and other specialists of our insurance carrier, Employers Mutuals of Wausau. These consultants bring to us a wealth of experience gained in many plants, and show us how we can do a better job in our plant. Mr. Kiser often has pointed out accident sources that we are so close to as to miss altogether. We are convinced that close cooperation of a good safety-minded engineer is invaluable in any successful safety program.

Some of our most important safety improvements are essentially very simple and inexpensive. Quite often only a simple change in setup, or the provision of a simple, low-cost tool will eliminate or minimize a safety hazard. A few of the safety improvements made in our plant are shown. Other production changes in the interest of making the shop a safer place to work are just as impressive.

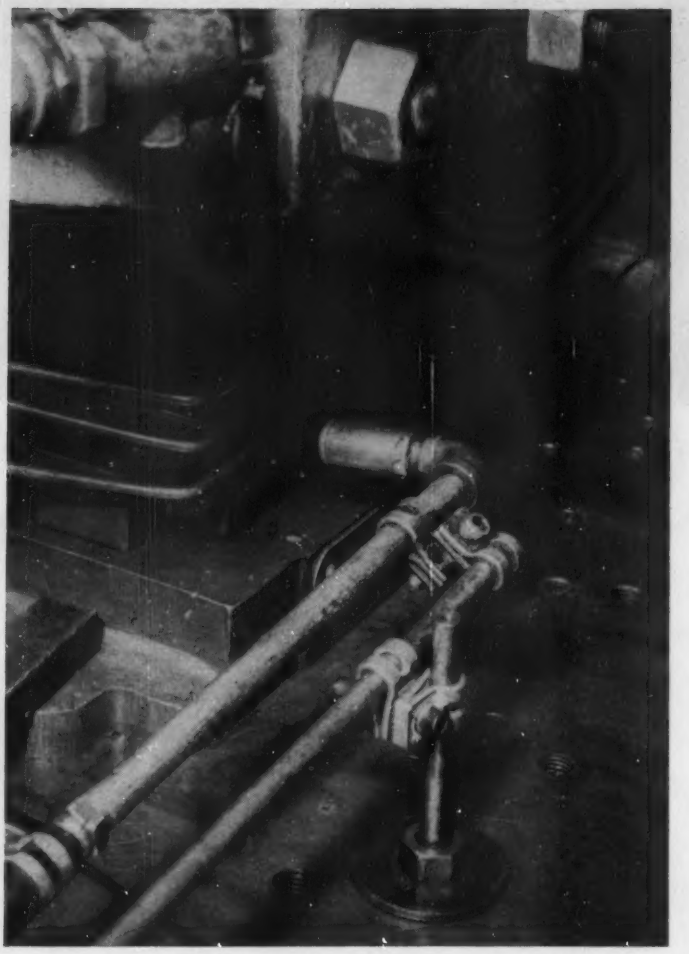
We eliminated welding fumes, for example, that were caused by the oil coating on the steel plates. Now, we dip the plates in a tank of cleaning solution tc remove the oil. The result is better welds and no more headaches among the welding crew. Many cut hands have been eliminated by tumbling small parts to remove burrs before they are handled. Also, we are building a special machine that will eliminate hand chiseling of flanges from plates sent back for salvage. This will eliminate another source of injuries.

If we have a safety secret, it is: Keep the men satisfied. Let them know that you are doing all you can to make their work safer and more congenial. It cuts accidents—and boosts production.

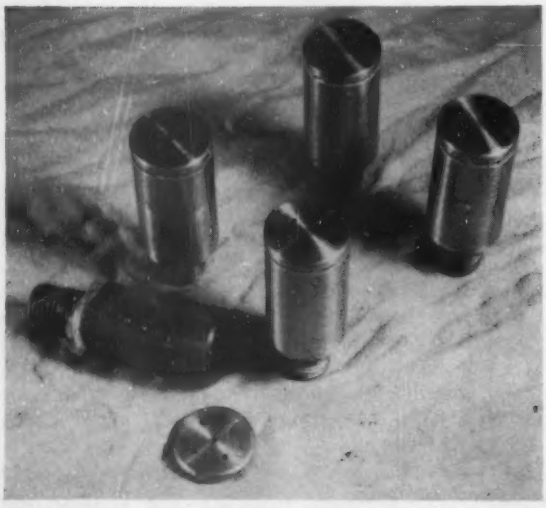
Hush up your ejector racket

Punch presses with these simple air-line mufflers make as much as 75% less part-ejecting noise, eject the parts more effectively, and use air at 25% less pressure

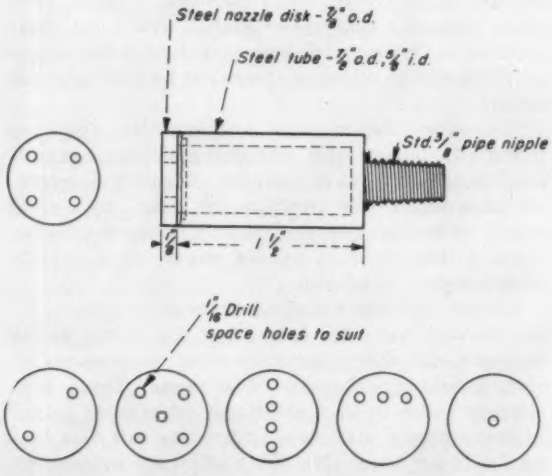
J G SCHLINDWEIN, tool supervisor,
LYON METAL PRODUCTS, INC, AURORA, ILL.



MUFFLER EJECTOR NOZZLE is made to suit individual press job to eject punched part better. Support rod is clamped to stud in bolster-plate hole; allows ejector adjustment

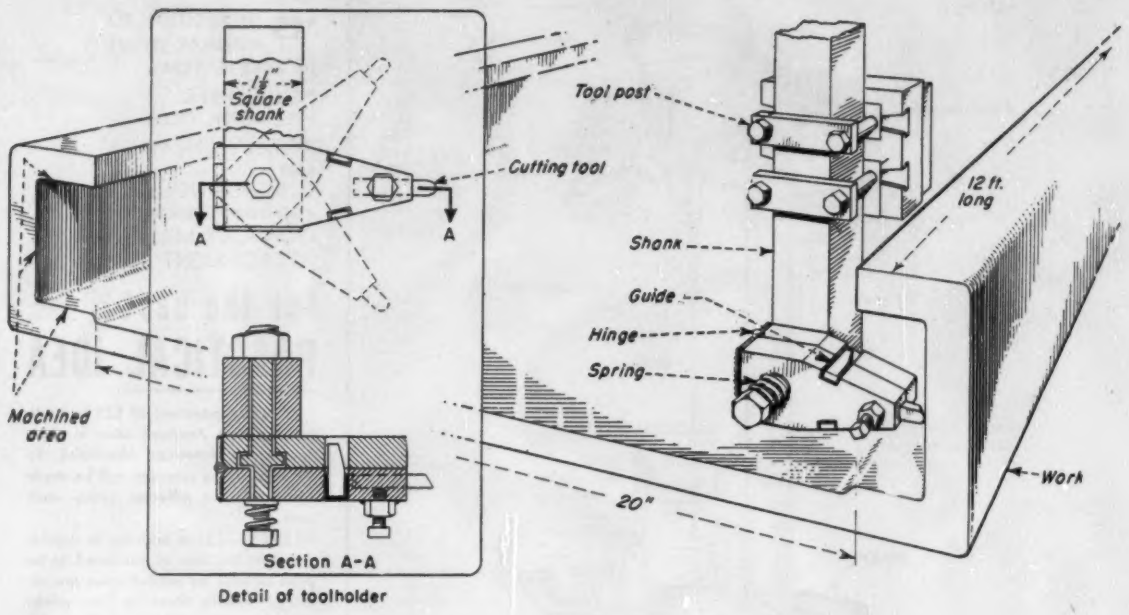


STANDARD PARTS make up mufflers—nipples, tubes—and end disks are drilled to suit the die. Assembly is by brazing



ONE TO FIVE HOLES are drilled in steel plates. Pattern and dimensions are not critical, but are tailored to needs

Practical Ideas . . .



Detail of toolholder

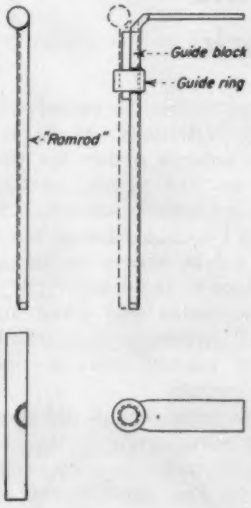
Hinged Toolholder Planes Parallel Grooves

We sometimes have some unusual jobs when repairing machinery, and have to find the quickest way to get a seemingly impossible job out in a hurry. Shown here is such a job, and the method we used to overcome the problem.

The operation was to plane two recessed grooves, 12 ft long, with both surfaces parallel. The conventional clapper box on the planer would not be able to lift the tool, because of the location of the grooves.

To do the job, we made the toolholder shown. The toolbit is held in a clapper box which can swing up or down, as shown, or can be moved completely around to do the groove on the opposite side of the work. The shank of the clapper box is a piece of square cold-finished steel. The support plate is held securely to the shank by a collar bolt and nut. The clapper box is attached to the support plate by a hinge, and is guided by two guide bars; one end of each of the guide bars is welded to the clapper.

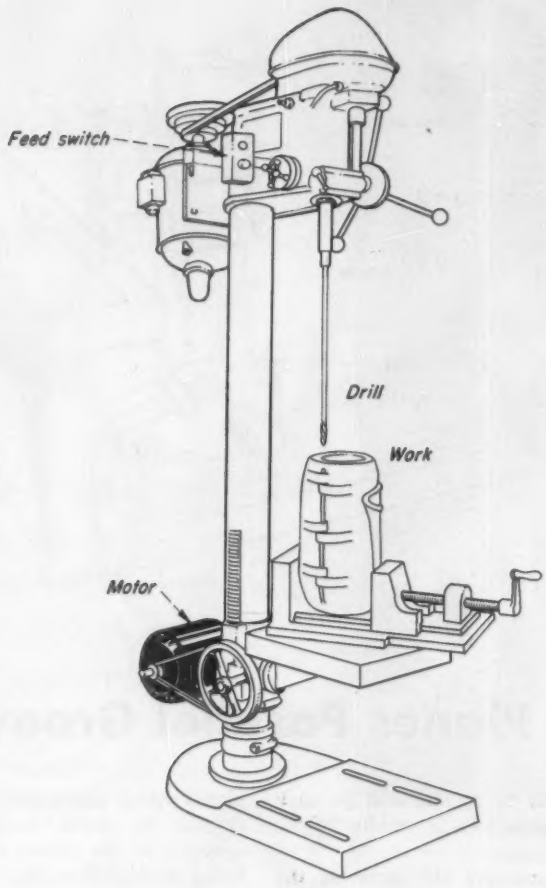
When cutting the grooves, the shank is clamped rigidly in the planer head, permitting the small clapper to work independently, opening on the return stroke, and being spring-closed for the cutting stroke. *H M James, Monroe, La*



"Wicking Gun" Helps Insert Wicks Into Bearings

Wicking in bearings must be tight, to insure a good fit, and it is quite hard to insert, say, a ⅝-in. wick in a ½-in. hole. With this little attachment, the job is made much easier.

The "gun" consists of two pieces —a half-round ramrod and a guide-block. The wick is put between these two pieces, which are then inserted in the hole for the wick. The ramrod is withdrawn first, then the guide-block can be taken out, and the wick will stay in place. *Jack Schofield, Lancashire, England*



Powered Drillpress Table Speeds Deep-Hole Work

We had a long-run job which required drilling some relatively deep holes (12 in.). The quill on our small floor-mounted drillpress would only go up and down about 6 in., so it meant cranking the table down to clear the chips during the deepest part of the drilling, and then cranking the table back up to the drill.

To try to shorten the job, we put a small, improvised table feed on the machine. This arrangement solved our problems quite well.

We mounted a ¼-hp motor on the back of the table mounting, so the motor would swivel with the table. (Actually, ¼ hp is more than enough power for this job, but we had several of that size that we weren't using). Then we put a 1½-in. sheave on the motor, and a 6-in. sheave on the spindle, in place of the crank.

The motor was wired with an SPDT switch, with a pushbutton on-off contact and an up-down snap switch.

This arrangement did the trick, with surprisingly little coasting after the motor power was stopped.

Charles Fry, Apple Creek, Ohio

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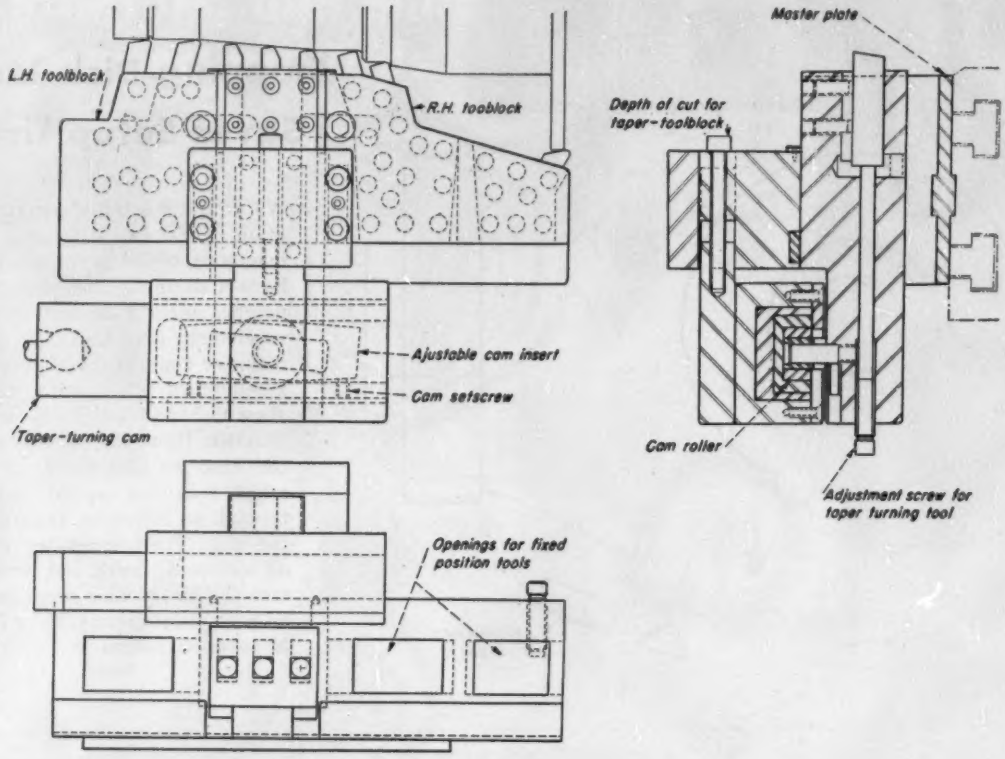
HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y



Adjustable Toolblocks Speed Setups

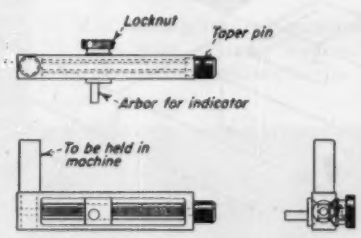
Wheel bearing fits and brake-support flanges on both ends of differential housings are turned and faced simultaneously in multi-tooled, center-drive automatic lathes which have similar tooling setups at each end of the workpiece.

Housing sizes range from 69 to 89 in. long, with wide variations in design of the wheel-mounting areas. As a result, changes in tool settings are needed when changing from one setup to another. It helps, therefore to simplify toolbit adjustment as much as possible.

By redesigning taper-turning attachments and supporting toolblocks, we have cut the time needed for setting taper-turning tool-bits in these setups.

Each taper-turning bit is individually adjustable, and the slide, which can carry as many as three bits, can also be radially adjusted. Angular adjustment of the block is set by turning setscrews with a screwdriver.

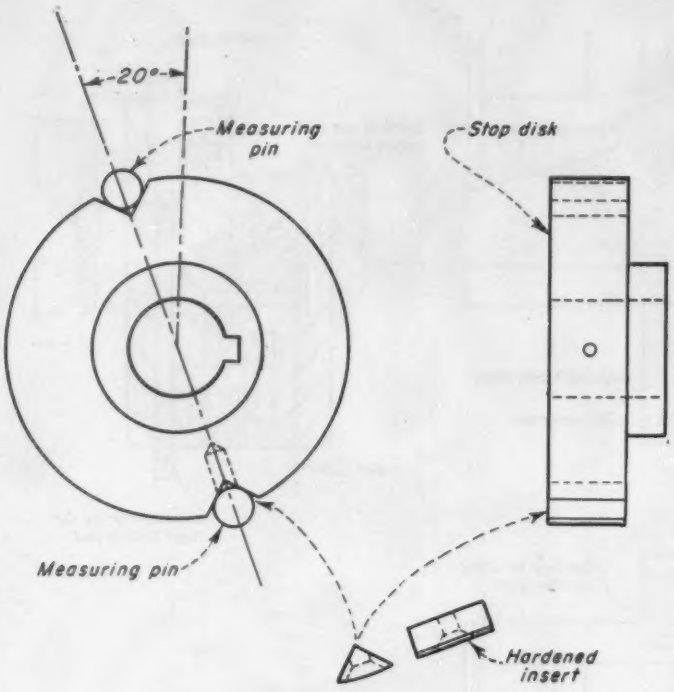
Slides holding one, two, or three toolbits are easily exchanged in the blocks mounted on each of the two front carriages of the lathe. *A G Gould, master mechanic, Automotive Div, Clark Equipment Co, Buchanan, Mich*



Indicator Center-Finder

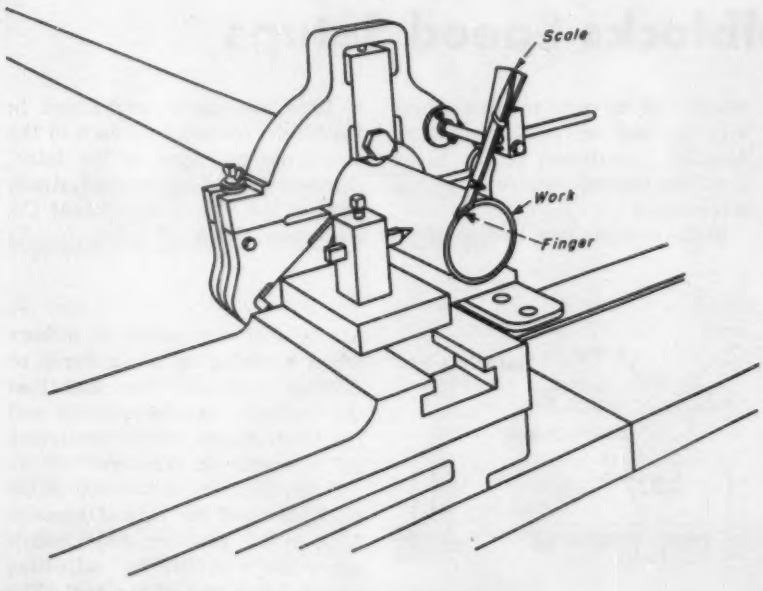
This handy little gadget is very useful for anyone who frequently has to find the center of a bore when working on a jig-borer or milling machine. The fact that the indicator can be quickly and positively moved makes "centering up" a matter of minutes.

A dial indicator is fastened on the stud provided for it, and remains fixed in this position. Adjustments are made with the fine adjusting screw at the end of the tool. The ½-in. stud is held in the chuck of the machine. *John McCafferty, Patchogue, NY*



Stopping-Disk Insert Saves Setup Time

We do quite a bit of second-operation work on automatic screw machines, which means we have to have a stopping disk with two V-notches instead of one. When we receive our machines from the factory, we replace the standard single-notched disk with the one shown here, which is common practice. However, when we make the disk we also make an insert which is drilled, tapped, and countersunk so it can be fastened into the disk. Then, when we want to do automatic work, we simply attach the insert. This saves us about an hour in setup time. *Mike Zmuda, Minneapolis, Minn*



Carbide-Tipped Finger Gages Cutoff Tubing Lengths

When we are cutting off tubing that is too big to fit in the spindle of our turret lathes, we use the setup shown here. The unusual part of this arrangement is the indicating finger which helps us hold proper length on the part being cut.

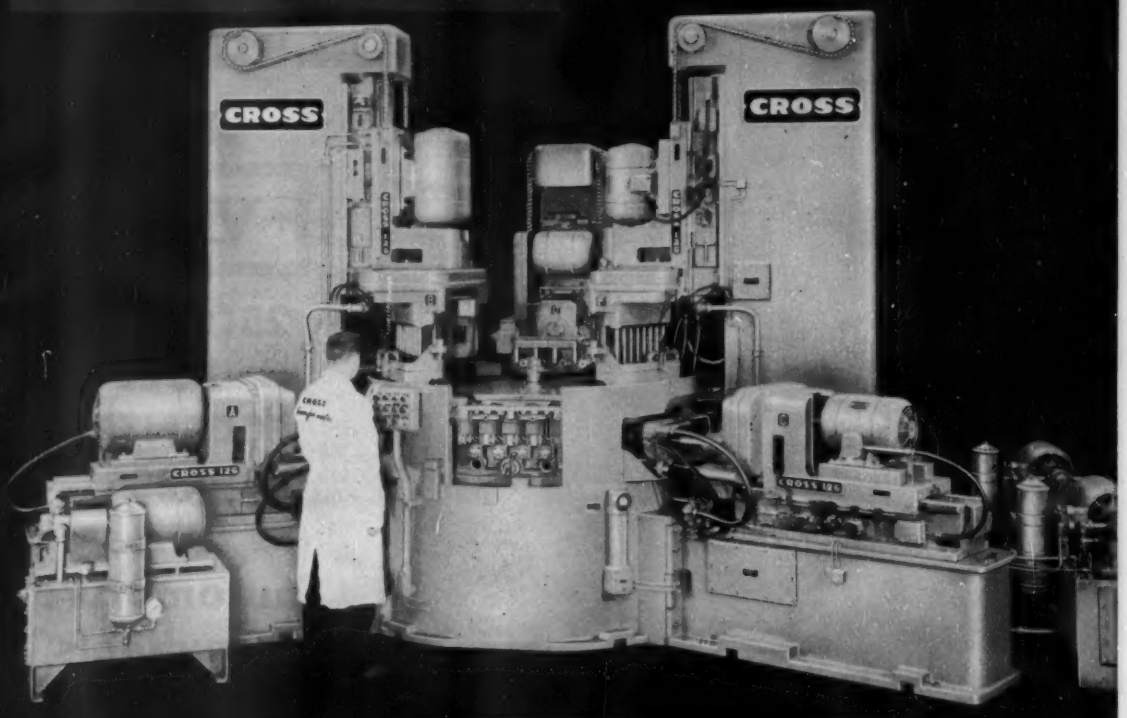
The finger is mounted on an adjustable bracket and arm, which in turn are bolted to the upper part of the steadyrest we use. The steadyrest is bolted and dowelled to the carriage of the lathe.

Two kinds of steadyrest jaws are used. One has replaceable bronze shoes, which we prefer for thin-walled material. The other set has needle-bearing rollers, of the kind used for cam followers.

The lower part of the indicating finger is carbide-tipped, where it bears against the stock. The pivot of the finger is set up so there is a 4-to-1 ratio of movement between finger and indicator. A small coil spring holds the finger firmly against the stock. *Frank O'Connell, Los Angeles, Calif*

Drills, Reams, Chamfers, and Mills Connecting Rods

Another Special by Cross



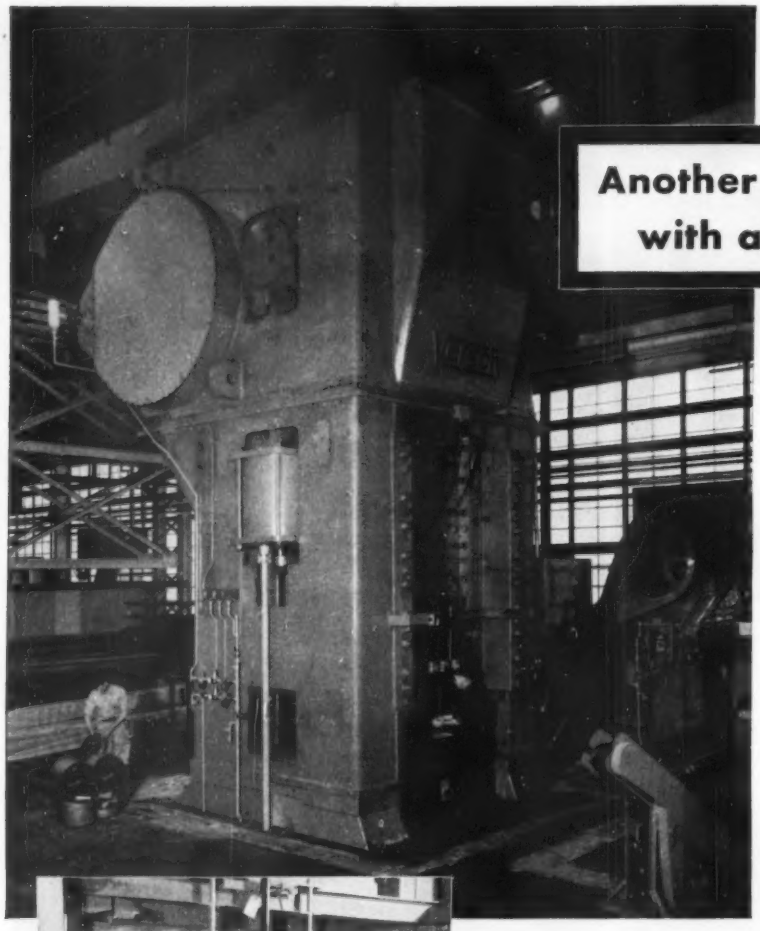
- ★ 450 pieces per hour at 100% efficiency.
- ★ 6 stations: 1 for loading, 2 for drilling, 1 for chamfering, 1 for milling, and 1 for reaming.
- ★ Drills, reams and chamfers bolt holes; drills, reams and chamfers piston pin hole; and mills lock slot.
- ★ Fluid motor driven index table.
- ★ Hydraulic power clamping for work holding fixtures.
- ★ Other features: Hardened and ground ways; coolant system; hydraulic feed and rapid traverse; construction to J.I.C. standards.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS



Another job done better with a Verson press

THIS Verson 2500 TON FULL ECCENTRIC PRESS forms automotive flywheels

Close-up of the die space in this 2500 ton Verson Full Eccentric Press showing the part being formed.

If you want to combine the highest standards of accuracy and uniformity in stampings with long, dependable, trouble-free press life, a Verson Full Eccentric Press is the answer. Verson Full Eccentrics incorporate the sum of over thirty years' experience in the manufacture of rugged high strength presses designed to produce better stampings at lower cost.

Such features as the Verson Allsteel Frame . . . the Verson full eccentric drive . . . straight thrust eccentric strap . . . extra long, barrel type, non-oscillating vertical adjusting screw . . . anti-overlap clutch and brake unit put Verson Full Eccentrics in a quality class by themselves.

The press shown above is typical of Verson Full Eccentric Presses. It is being used to form heavy flywheels on a high production basis. Note the long, extra heavy special gibbing and rugged construction throughout—assurance of the accuracy and uniformity required in a part like this.

The Verson Full Eccentric line includes models with one, two and four point suspension in capacities from 100 tons up. Further data is given in Catalog G-52. Write for your copy.

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

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New Wrought-Aluminum Designations...I

A new system of alloy designations for wrought aluminum and aluminum alloys has been adopted by The Aluminum Association and becomes effective October 1, 1954. Membership of the association accounts for all the primary aluminum produced in the United States and more than 85% of the wrought products.

Consisting of four-digit numbers, the new system is expected to meet all present and future needs for wrought alloy designations. To aid in the transition to the new system, many of the old numbers are retained as the last two digits of the new numbers.

Temper designations in effect since December 31, 1947, are continued without change and follow the alloy designation with a dash for separation. Thus 3S-0 is now AA 3003-0, Alcad 24S-T81 is now Alcad 2024-T81, and 75S-T6 is now AA 7075-T6.

FOUR-DIGIT SYSTEM

The first digit of the designation serves to indicate alloy groups as shown in Table I. The last two digits identify the aluminum alloy or indicate the aluminum purity. The second digit indicates modifications of the original alloy or impurity limits.

Although most aluminum alloys contain several alloying elements, the major groups are determined by the major alloying element. Except that one group, 6xxx for alloys with magnesium and silicon as major alloying elements, designates two elements.

ALUMINUM

In the 1xxx group for aluminum of 99.00% minimum and greater, the last two digits indicate the minimum percentage to the nearest 0.01% above the 99.00 base.

The second digit in the designation indicates modifications in impurity limits. If the second digit is zero, there is no special control on individual impurities, while integers 1 through 9 (assigned consecutively as needed) indicate special control of one or more individual impurities. Thus AA 1030 indicates 99.30% minimum aluminum without special control on individual impurities and AA 1130, AA 1230, AA 1330, indicate the same purity with special control of one or more impurities.

ALUMINUM ALLOYS

In the 2xxx through 8xxx groups the last two digits have no special significance but serve only to identify the different alloys in the group. Generally these digits are the same as those formerly used to designate the same alloy. Thus 14S becomes AA 2014, 3S becomes AA 3003, and 75S becomes AA 7075. For new alloys after October 1, 1954, the last two digits will be assigned consecutively beginning with xx01.

The second digit indicates alloy modifications. If the second digit is zero it indicates the original alloy; integers 1 through 9, assigned consecutively, indicate alloy modifications. In the former system, letters were assigned consecutively, beginning with A, to designate modifications. Thus 17S is now AA 2017 and A17S is now AA 2117; 18S is AA 2018 and B18S is AA 2218.

EXPERIMENTAL ALLOYS

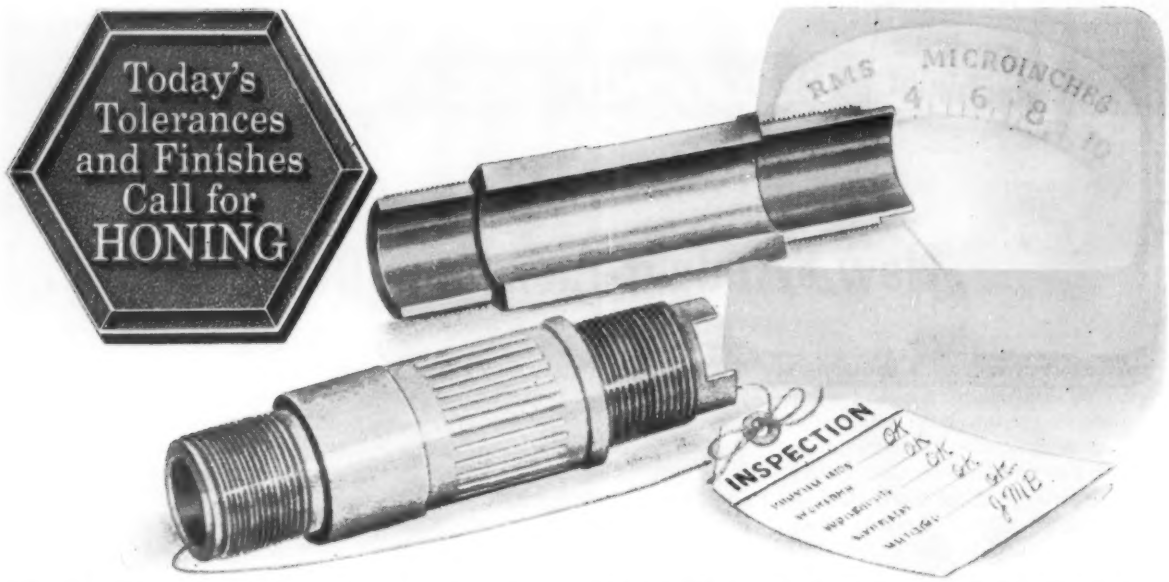
Experimental alloys are designated by the same four-digit system with the prefix X. The prefix is dropped when the alloy becomes standard. During development, and before they are designated as experimental, new alloys are identified by serial numbers assigned by their originators. Use of the serial number is discontinued when the X number is assigned.

AMERICAN MACHINIST PRACTICE

Until the new system of designations has had time to become familiar to readers, it will be the practice in articles in *American Machinist* to designate alloys by the new system with the old designation following in parenthesis. For example, "The strut is AA 7075-T6 (75S)."

table I ... New Designations for Aluminum-Alloy Groups

Aluminum — 99.00% minimum and greater		1xxx
	Major Alloying Element	
Aluminum Alloys grouped by major Alloying Elements	Copper	2xxx
	Manganese	3xxx
	Silicon	4xxx
	Magnesium	5xxx
	Magnesium and Silicon	6xxx
	Zinc	7xxx
	Other element	8xxx
Unused Series		9xxx



PERFECT SEAL AT 5000 PSI PRESSURE between ringless piston and cylinder

Sunnen-honed Nitralloy cylinder assures metal-to-metal high pressure seal

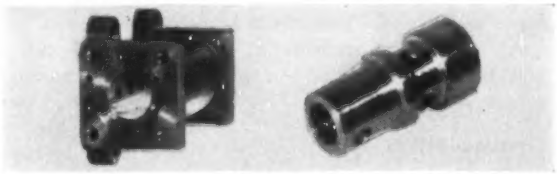
PROBLEM: To achieve high production rate with a hole tolerance of .504″, +.00005″, −.00000″.

Hole specifications also call for perfect straightness and roundness throughout its length. Surface finish must be 3 micro-inches RMS or better. Piston must move freely without leakage up to 5000 psi. Percentage of rejects and scrap must be low.

SOLUTION: Installation of Sunnen Honing Machine with air gaging equipment increased production 4 times over previous production method. Production rate, including gaging, is now 45 cylinders per hour—less than 1½ minutes per part. Average stock removal of Rockwell 63C hardness material is .001″. The honed cylinders are uniform and lapping was eliminated. Improved seal between piston and cylinder insures longer service life of pump assembly.

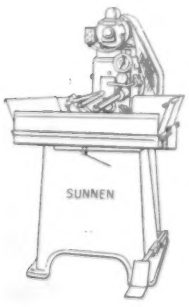
For this company Sunnen Honing cut production costs, and at the same time contributed to product improvement. And for many other manufacturers of hydraulic and air controls, valves and cylinders, it has proved the answer to similar production and engineering problems.

It is economical for job lots as well as long production runs, for de-burring as well as micro-fitting, for reduction of rejects as well as elimination of bottlenecks. In practically every case it is less costly than internal grinding or lapping.



Sunnen Honing Machines generate geometrically perfect holes with fast stock removal, produce a guaranteed accuracy of .0001″ and surface finish to 2 micro-inches RMS . . . have a diameter range of ⅛″ to 2⅝″ . . . require no jigs or fixtures. They are used in thousands of plants in Production, Tool Room, Maintenance, and Salvage. Average installation costs less than $1,000.

Find out how these machines may help you cut production costs . . . Mail the coupon now for booklet of 105 typical honing jobs.



FREE BOOKLET *shows 105 typical honing jobs—case histories—production rates. Use coupon or post card to get your copy.*

SP-799

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St. Louis 17, Mo.

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Company _____

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New Wrought-Aluminum Designations...II

table II ... OLD-TO-NEW Conversion of Aluminum-Alloy Designations

OLD Commercial Designation	NEW AA Number	OLD Commercial Designation	NEW AA Number	OLD Commercial Designation	NEW AA Number	OLD Commercial Designation	NEW AA Number
99.3[4]	1230	3S	3003	A50S, K155, R305	5005	72S	7072
99.6, CD1S	1160	4S	3004	XD50S	X5405	75S	7075
99.75[3]	1175	XA5S	X3005	A51S	6151	B77S	7277
99.87, EB1S	1187	11S	2011	XB51S	X6251	XA78S	X7178
EC[1]	EC	14S, R301 Core	2014	J51S, K160	6951	XB80S	X8280
AA1S	1095	XB14S	X2214	52S	5052	K112	8112
BA1S	1099	XC16S	X2316	F52S	5652	K143, C43S, 44S	4343
CA1S	1197	17S	2017	53S	6053	K145, 43S	4043
AB1S	1085	A17S	2117	B53S	6253	K155, A50S, R305	5005
EB1S, 99.87	1187	18S	2018	XD53S	X6453	K157, C57S	5357
FB1S	1090	B18S	2218	E53S	6553	K160, J51S	6951
AC1S	1070	F18S	2618	A54S	5154	K162, R306[5]	6003
BC1S	1080	24S	2024	B54S	5254	LK183	5083
CC1S, R998	1180	25S	2025	X55S	X5055	K186	5086
JC1S	1075	B25S	2225	56S	5056	R301 Core, 14S	2014
AD1S	1050	32S	4032	XC56S	X5356	R305, K155, A50S	5005
BD1S	1060	43S, K145	4043	C57S, K157	5357	R306, K162[5]	6003
CD1S, 99.6	1160	C43S, 44S, K143	4343	61S	6061	R308[2]	1130
ED1S	1150	XE43S	X4543	62S	6062	R399	8099
AE1S	1030	44S, C43S, K143	4343	63S	6063	R995	1235
BE1S	1145	45S	4045	66S	6066	R998, CC1S	1180
2S	1100	50S	5050	70S	7070		

table III ... NEW-TO-OLD Conversion of Aluminum-Alloy Designations

NEW AA Number	OLD Commercial Designation	NEW AA Number	OLD Commercial Designation	NEW AA Number	OLD Commercial Designation	NEW AA Number	OLD Commercial Designation
EC[1]	EC	1197	CA1S	4043	43S, K145	6061	61S
1030	AE1S	1230[4]	99.3	4045	45S	6062	62S
1050	AD1S	1235	R995	4343	C43S, 44S, K143	6063	63S
1060	BD1S	2011	11S	X4543	XE43S	6066	66S
1070	AC1S	2014	14S, R301 Core	5005	A50S, R305, K155	6151	A51S
1075	JC1S	2017	17S	5050	50S	X6251	XB51S
1080	BC1S	2018	18S	5052	52S	6253	B53S
1085	AB1S	2024	24S	X5055	X55S	X6453	XD53S
1090	FB1S	2025	25S	5056	56S	6553	E53S
1095	AA1S	2117	A17S	5083	LK183	6951	J51S, K160
1099	BA1S	X2214	XB14S	5086	K186	7070	70S
1100	2S	2218	B18S	5154	A54S	7072	72S
1130[2]	R308	2225	B25S	5254	B54S	7075	75S
1145	BE1S	X2316	XC16S	X5356	XC56S	X7178	XA78S
1150	ED1S	2618	F18S	5357	C57S, K157	7277	B77S
1160	CD1S, 99.6	3003	3S	X5405	XD50S	8099	R399
1175[3]	99.75	3004	4S	5652	F52S	8112	K112
1180	CC1S, R998	X3005	XA5S	6003[5]	R306, K162	X8280	XB80S
1187	EB1S, 99.87	4032	32S	6053	53S		

Notes to Tables II and III:
(1) EC—The designation for electrical conductor metal is not being changed since it is so firmly established in the electrical industry.
(2) No. 1 Reflector Sheet.
(3) Cladding on No. 2 Reflector Sheet.
(4) Cladding on Alclad 2024 (Alclad 24S).
(5) Cladding on Alclad 2014 (R301 and Alclad 14S).

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Marking of Compressed-Gas Containers

F R FETHERSTONE, secretary-treasurer, COMPRESSED GAS ASSOCIATION, INC

In the opinion of the owners of compressed-gas cylinders, the most satisfactory method for indicating the material contained is through the use of legend (the written word) applied to the cylinder in a manner that will assure its legibility. This view is supported by Sectional Committee Z48 working under the procedures of the American Standards Association, which recently approved a revision of American Standard Z48.1, entitled "American Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained."

In this revision, the standard has been expanded to include a reference to containers intended for use in international trade. In principle, use of legend is the basic method for indicating the material contained, and proposals to use colors for that purpose have been rejected.

The American Standard states:

1. Scope

1.1 Requirements for marking portable compressed-gas containers, not exceeding 1000 lb water capacity, to identify the material contained.

2. Definitions

2.1 A portable compressed-gas container, for the purposes of these standards, is any container having a water capacity of 1000 lb or less, that is constructed in accord with the specifications of a recognized authority (such as the specifications of the Interstate Commerce Commission, the Unfired Pressure Vessel Code of the ASME, the API-ASME Unfired Pressure Vessel Code, etc) and intended to contain a compressed or liquefied gas, as defined in the Regulations of the Interstate Commerce Commission.

3. Marking of Containers

3.1 Compressed-gas containers shall be legibly marked with at least the chemical name or a commonly accepted name of the material contained. Marking shall be by means of stenciling, stamping, or labeling, and shall not be readily removable.

3.2 Wherever practical the marking shall be located at the valve end and off the cylindrical part of the body.

3.3 The height of the lettering shall be not less than one twenty-fifth (1/25) of the diameter of the container with a minimum height of ⅛ in.

4. Marking of Containers for Use in International Trade

4.1 Compressed-gas containers for use in international trade shall be legibly marked by means of stenciling, stamping, or labeling and as noted above, and such markings shall not be readily removable.

4.2 With the name of the material contained in the language of the country in which the container is charged.

4.3 With the international chemical formula, or other agreed abbreviation, as follows:

Acetylene	C_2H_2
Air	AIR
Ammonia	NH_3
Argon	Ar
Boron trifluoride	BF_3
Butane, Propane or their mixtures	LP-Gas or LPG
Carbon dioxide	CO_2
Carbon monoxide	CO
Chlorine	Cl_2
Coal gas	GDV
Cyclopropane	(no formula)
Dichlorodifluoromethane	CCl_2F_2
Difluoroethane	$C_2H_4F_2$
Difluoromonochloroethane	$C_2H_3ClF_2$
Ethane	C_2H_6
Ethyl bromide	C_2H_5Br
Ethyl chloride	C_2H_5Cl
Ethylene	C_2H_4
Ethylene oxide	C_2H_4O
Fluorine	F_2
Helium	He
Hydrogen	H_2
Hydrogen chloride	HCl
Hydrogen cyanide	HCN
Hydrogen fluoride	HF
Hydrogen sulphide	H_2S
Illuminating gas	
Krypton	GDV
Methane	Kr
Methyl bromide	CH_4
Methyl chloride	CH_3Br
Monochlorodifluoromethane	CH_3Cl
Natural gas	$CHClF_2$
Neon	METNe
Nitrogen	N_2
Nitrogen peroxide	N_2O_4
Nitrosyl chloride	NOCl
Nitrous oxide	N_2O
Oxygen	O_2
Phosgene	$COCl_2$
Propane, Butane or their mixtures	LP-Gas or LPG
Propylene	PRY
Sulphur dioxide	SO_2
Sulphur hexafluoride	SF_6
Town gas	GDV
Vinyl chloride	C_2H_3Cl
Xenon	Xe

Color coding is not used for a number of good reasons. First, there are more than 60 gases shipped in these containers, and there are only seven primary colors. Second, combinations of colors would have to be used, and these combinations would require an identification system. Third, there would be a wide variation in the accuracy with which the color coding system would be translated, especially considering the variations in visual acuity, fading, and how shades appear under different kinds of illumination.

NOW Cut Your Carbide Tooling Costs in Half!

See chart below to determine how much you can save.

New V-R Toolholder for "Throw-Away" blanks is available either with Negative Rake or Neutral Rake. Styles are available for triangular, square and round "Throw-Away" blanks.

with V-R Toolholders* and "Throw-Away" Blanks!

- No Chipbreaker Grinding
- Lower Tool Inventory
- Available with Negative or Neutral Rake
- No Carbide Grinding
- Cutting Edge Automatically Positioned
- Another Cutting Edge Quickly Available

More Economical Than Brazed Tools

Compare The Cost Per Cutting Edge...

The costs on a brazed tool's useable cutting edges are:

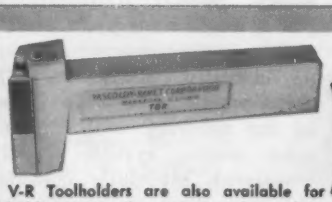
1. Original cost of the tool
2. Cost of each regrind
3. Number of regrinds obtainable

Formula for computing cost per cutting edge

V-R "Throw-Away" Blank Cost Per Cutting Edge								
"Throw-Away" Blank Style and Size	Triangular				Square		Round	
	¼"IC	⅜"IC	½"IC	⅝"IC	⅜"sq	½"sq	⅜"	½"
Utility Class for NEGATIVE RAKE Type	.06	.10	.20	.33	.07	.15	..	..
UTILITY Class for NEUTRAL RAKE Type	.12	.20	.40	.66	.15	.30	..	..
PRECISION Class for NEGATIVE RAKE Type	.10	.17	.27	.42	.13	.23	.06	.11
PRECISION Class for NEUTRAL RAKE Type	.20	.34	.54	.84	.27	.47	.16	.26

$$\frac{\text{(Cost of Tool)} + \text{(No. of regrinds} \times \text{cost per grind)}}{\text{Number of regrinds} + 1 \text{ (for original tool)}} = \text{Cost per cutting edge}$$

Compute the cost per cutting edge for a typical brazed tool you use and compare it with cost per cutting edge of a "Throw-Away" blank!



V-R Toolholders are also available for holding triangular, square and round inserts up to 1½" long. See Toolholder Catalog VR-435.

Write Today for New Toolholder Catalog and Price List VR-436

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*Patent Pending

Talking Shop . . .

Non-Casey RR

WE'VE HEARD of the smallest RR in the world, the longest RR in the world, and so on, but we were a little surprised to hear about what is admitted to be the "World's *Worst* Railroad."

The roadbed, in the plant yard of Sperry Products, Danbury, Conn, is made up from samples of the worst rail faults found in the thousands of miles of track tested by Sperry's rail-inspection cars, as they travel around the country. The purpose of the track is to provide a guaranteed source of faults for cars as they are checked out after being reconditioned. The faults certainly are there, too—about 120 different kinds of breaks, cracks, pits, holes, and otherwise dangerous faults—all in about 1/5 of a mile.

Pure Metals

DEMANDS of electronics and the defense program have accelerated efforts to obtain high-purity metals. NJ Zinc, GE, Westinghouse, Union Carbide and University of Va have all been working on it. Some of these pure metals show properties quite different from those expected. Iron for example, shows tensile strengths of almost a million psi, far above that of known alloys. Chromium and vanadium are not brittle, but highly ductile. If you're interested, see "Pure Metals" in *Scientific American* for July.

Machine Shop Hi-Fi

LATEST WRINKLE in automatic tape control, developed by Alfred Herbert, Ltd, England, employs a standard commercial tape recorder on which machine impulses are recorded in musical frequencies and can be heard as musical tones if the output is coupled to a loudspeaker. In operation, the notes excite tuned reeds which, in turn, operate solenoids by means of slave relays. First installation was on a Heald *Bore-Matic*, and was simple and inexpensive. Tape is prepared by performing the various operations by hand —in slow motion if necessary—and the machine can be stopped for planning the next sequence or setting the tools. On playback, the tape can be speeded up to the machine's correct operating speed.

Penmanship Works

MINNEAPOLIS-HONEYWELL'S Industrial Div, Phila, has now completed the pilot 2-week course in number penmanship (*AM*-June 21 '54, p165). Average increase in speed of recognition of numbers was 20%, accuracy went up 9%, legibility of handwriting up 6%. About 40 employees took the course.

Back to Plain Bearings?

SPECULATING on future bearings, E C Helmke of Gisholt Machine Company, speaking at the ASME Fall meeting, suggested a return to sleeve bearings in large spindles, particularly in lathes. Inevitably, the tolerance in a big anti-friction bearing will lead to some inaccuracy of the spindle, and perhaps to vibration. This reduces the quality of surface finish that can be produced on the work at high speeds — where the finish should be at its best. Some grinder makers have already switched back to plain bearings on large grinders . . . Availability of Teflon, nylon, and similar plastics and their success in small bearings suggests further research on larger ones. Possibly the newer synthetic lubricants would raise permissible speeds and give a new plain-bearing material as successful at high surface speeds as plastic ways have been on heavy-duty planers at lower ones.

Abrasive Lubricant

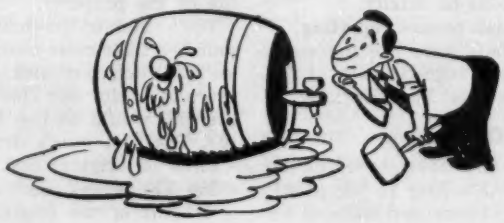
LOAD-CARRYING CAPACITY of copper-lead and aluminum sleeve bearings has been more than doubled by adding fine rouge (1-micron particles), according to two U of Texas men at the ASME Fall meeting. Rouge improved the surface finish of the bearings under low loads, made them better able to withstand high ones. Molybdenum sulfide, in 39-micron particles, was effective in copper-lead bearings, increasing load capacity 60% when ½ gram was added to each gallon of lube. It did not help in softer babbitt bearings. Small amounts of 6-micron corundum increased friction of clean oil about four times in aluminum and copper-lead bearings. Bearing surfaces were roughened by 22-micron corundum and wear was rapid as soon as corundum particles were larger than oil-film thickness. This indicates the importance of good filtering of lube, particularly when the harder bearing materials are used.

Convair Quality

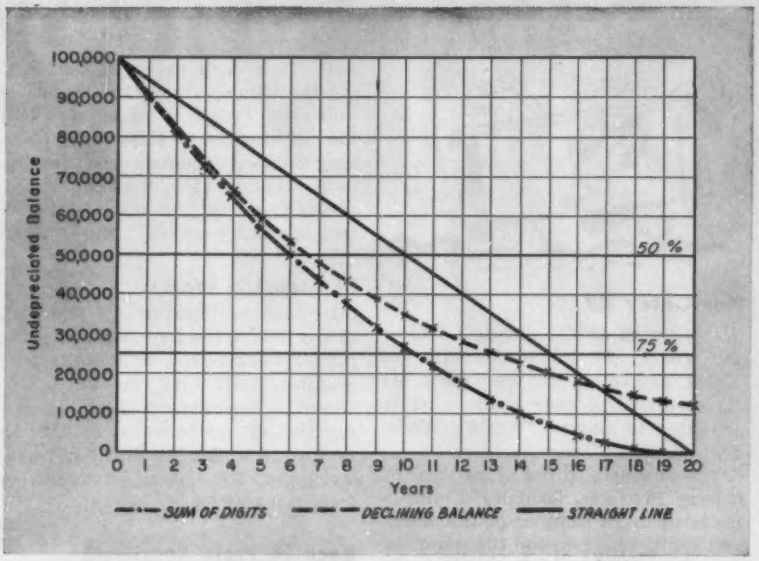
CONVAIR has about 1000 people in quality control at San Diego alone, headed by a man reporting directly to the Division manager. The unit is divided into three departments: process control ("how to" people), administration (inspection directives), and inspection (actual measuring and testing). Cost last year of quality control there was $5½ million, according to Gen J F McNarney, president.

Can't Eat & Have

SELECTIVE SERVICE has, during the past year, drafted 3500 graduate students working along scientific lines. Annual crop of scientific degrees is 10,700, and the military say we need 20,000 with advanced degrees each year—but meanwhile have lost all track of civilian scientists who worked for the military in the years since World War II. Is this another example of worrying about the spigot on the manpower barrel, and forgetting about the bung?



THE NEW U.S. TAX LAWS —here's how they affect



First major revision of US tax laws in 75 years is making itself felt on Metalworking's accounting and tax reporting practices in 10 major areas — all the way from capital goods depreciation down to exemptions for meals and lodging furnished employees

NEW YORK — What difference will the newly overhauled tax code make to Metalworking's tax-reporting practices? How does it differ from the old code? American Machinist's editors and Washington Bureau men have talked with tax specialists and Treasury officials. Their report: Metalworking will feel the effects of the revisions in 10 major areas:

- **Depreciation.**
- **Research and development.**
- **"Pay-as-you-go."**
- **Net operating loss carryback.**
- **Computing net operating loss.**
- **Surtax on accumulated earnings.**
- **Meals and lodging.**
- **Dependency rules.**
- **Contributions to charity.**
- **Accrual-basis income reporting.**

In a nutshell, here are the ways in which tax changes in each of the 10 categories affect Metalworking.

DEPRECIATION

Under the new rules governing depreciation (*AM*—Aug 16 '54, p158), there are two liberalized methods for figuring depreciation. These are the declining balance and sum-of-the-digits methods in addition to straight-line.

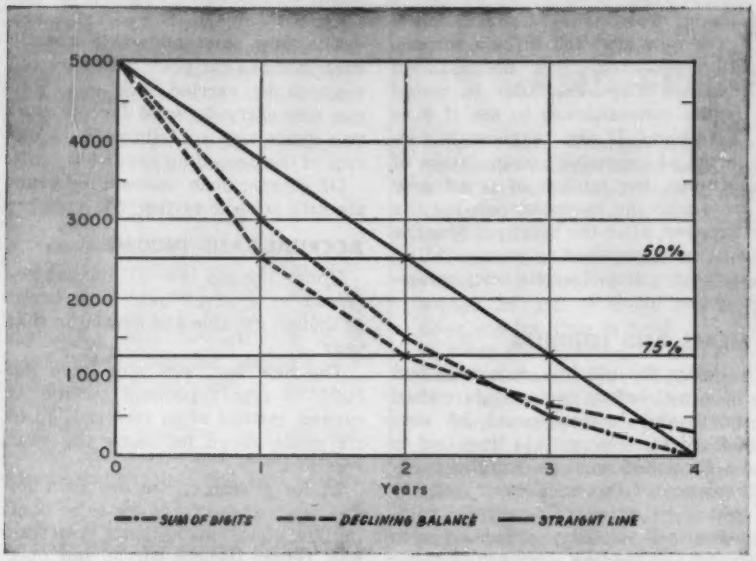
The declining balance method lets the taxpayer depreciate capital goods at a maximum of double the straight-line percentage for the first year, double the straight-line percentage of the *undepreciated balance* for the second year, and so on. Instead of using either of the liberalized depreciation methods, the taxpayer can, if he chooses, use any consistent method of depreciation which doesn't exceed the depreciation allowable at a 200% declining-balance rate during the first 2/3 of the useful life of the property.

The sum-of-the-digits method sounds a little more complicated, but isn't. All taxpayer does is add up the years of useful life (for a four-year life, this would be $1 + 2 + 3 + 4 = 10$). The first year's depreciation is 4/10ths of original cost of the machine. The second year's depreciation is 3/10ths of the original cost, and so on until the machine is written off.

These liberalized methods apply only to *brand-new* capital goods or construction, *acquired or built after January 1, 1954*. If the taxpayer starts a building in 1953, and construction goes on into 1954 (or later), he can only apply liberalized depreciation to that part of the "basis of the property" (this usually means the cost), actually done after January 1, 1954. For example, if you start a $1-million building toward the end of 1953, and complete $150,000 of construction by Dec 31, 1953, and then finish the building, you must use straight-line depreciation on the $150,000 part of the cost. But you can take your pick of either the new or old methods of depreciation for the remaining $850,000 capital balance.

These liberal depreciation methods apply only to property with a useful life of 3 years or more.

By filing a tax return using one of these more liberal accounting methods for depreciation, a firm automatically elects (and must generally stick to) the method chosen. There are as yet undetermined conditions, pending publication of Treasury Department Regulations, which will allow a switch back to straight-line from declining balance, but under no circumstances can a switch be made from straight-line, once chosen, to declining balance, or from



Metalworking

sum-of-the-digits to straight-line.

The charts show the effect of the three methods — sum-of-the-digits, declining balance, and straight-line— for short-life and long-life property. Liberalized depreciation has a greater effect on short-life property. With the declining-balance method, the property is never completely written off—at the end of the useful life, there is a small amount of undepreciated capital balance.

RESEARCH AND DEVELOPMENT EXPENSES

This subject was not treated in the old codes. This led to a confusing situation: generally an established research department could be charged to current expenses, but extraordinary research expenses had to be capitalized. The problem here was that the company that did occasional research (usually a small company) was at a tax disadvantage, compared to large companies that maintained a research department at all times.

The new law: two options are offered:

- It is permissible to deduct, as current expenses, all research and development costs for taxable years after 1953. But this must be done in the first year after 1953 in which you have such expenses. Otherwise you cannot do so without the consent of the tax Commissioner.
- The taxpayer may elect to amortize research and development expenses ratably over not less than 60 months. But if these costs can (1) be clearly attributed to a specific property which (2) can be shown to have a determinable life, then, under this option, the costs have to be amortized ratably over the entire useful life of the property.

With both these latter arrangements, the deductions may not start until the taxpayer begins to realize the benefits of the research costs he is amortizing.

The new law also provides that research and development costs can only be applied to a business expense which is otherwise not chargeable to capital. For example, a building in which research is conducted cannot be charged off as research expense, but must be depreciated by one of the methods for normal depreciation of that kind of facility.

"PAY-AS-YOU-GO"

Under the old law, companies paid their income tax after the end of their fiscal year. They had the choice of paying the entire tax on March 15th (for calendar-year companies), or of paying two equal installments, on March 15th and June 15th.

The new law: Corporations "reasonably expecting" to make enough income to owe more than $100,000 taxes will start paying their taxes before the end of their fiscal year. Here's how it will work: If you expect to pay more than $100,000 taxes for the calendar year 1955 (for calendar year companies—see below for fiscal year companies) you will have to file, on September 15th, 1955, an estimated tax return (the same way personal income tax works now), stating what you expect your income tax to be. With this return, you'll subtract $100,000 from the tax total, and pay 10% of the rest, in 2 equal instalments, on Sept 15th and December 15th. Then, on March 15th, you'll file a final return, paying all or half the remaining tax due, as before.

If something unexpected happens between September 15th and December 15th, so your estimate is too high or too low, file an amended return with the December 15th payment. The amount of tax paid with an amended return is figured this way: Calculate what total you should have paid in September and December (based on the amended income-estimate). Subtract the payment you paid in September, and pay the rest.

The percentage due with these estimates increases 10% each year, so in 1956 you'll pay 20%, and so on, until, after five years, the instalments are 50% of the total estimated tax (less the $100,000 exemption).

The remaining tax due is paid either on March 15, when the final tax return is in, or in equal instalments on March 15 and June 15. The $100,000 "exemption" is also paid at this time.

Reason for the $100,000 exemption is this: the government studied the size of corporate income tax payments, found that only about 10% of US companies paid more than $100,000 annual income tax — but those same companies pay approximately 90% of all US corporate income taxes.

Now, with the $100,000 exemption, the government finds (1) it has fewer returns to check, (2) smaller companies, which generally have less working capital, are exempt from paying the estimated tax, and (3) the bulk of tax money is paid into the Treasury in four equal instalments each year, instead of in a single payment at the end of the fiscal year.

With this scheme, the government will overcome a long-standing money handling problem. In past years, government receipts from corporate taxes came in most heavily around March 15 and June 15. Now government receipts will be spread more

evenly throughout the fiscal year.

This description of estimated taxes applies to calendar-year companies. Fiscal-year firms file their first estimates on the 15th day of the ninth month of their first fiscal year after Dec 1, 1955, and so on.

How to Avoid Penalties

There are four ways to avoid paying a penalty for filing the wrong estimated tax:

- If your tax estimate is at least 70% of the actual tax due, you aren't subject to a penalty.
- Base your payment on the previous year's tax.
- Base your payment on the previous year's income and the current year's tax rate.
- Take your average monthly income for the first six or eight months (whichever you choose) and multiply it by 12 to get your estimated annual income. This is for the September estimate only. For December estimates, base your average monthly income on nine or 11 months, instead of six or eight months.

If your tax instalment later turns to be less than 70% of the tax due, you must pay a penalty of 6% of the difference between what you paid and what you should have paid unless you have used one of the three latter methods described above.

NET LOSS CARRYBACK

Under the new law, net operating loss carryback goes back two years instead of the one year allowed under the old law. You can still carry the loss forward for five years.

CHANGES IN COMPUTING NET OPERATING LOSS

There are several changes in computing net operating loss, which apply to taxable years ending after Dec 31, 1953. Here are examples:

- No adjustment in net operating loss has to be made for tax-exempt interest, either when computing loss or when applying loss to a prior year's income.
- Full amount of percentage depletion is allowable, even if it exceeds cost depletion.
- Allowable corporate deduction for dividends is not affected when figuring net operating loss.

SURTAX ON ACCUMULATED EARNINGS

Under the old law, the taxpayer paid a penalty if he could not prove that accumulated funds were necessary for "reasonable business needs."

The new law: $60,000 is automatically deducted from accumulated earnings. The remainder is tested by the commissioner to see if it is "excessive." If any taxpayer is suspected of excessive accumulation of earnings, the burden of proof now rests with the commissioner, not the taxpayer, after the taxpayer files the statement required in answer to an advance notice of a deficiency assessment.

MEALS AND LODGING

Under the old law, two tests had to be met before company-furnished meals and lodging could be considered tax exempt: (1) they had to be furnished workers for the "convenience of the employer," and (2) that they did not "constitute compensation"—in other words, if such meals and lodging were a reasonable part of the employee's income, the employee would have to pay tax on them.

The new law: the test of "constituting compensation" no longer holds true. Employees receiving meals and lodging furnished for the "convenience of the employer" do not pay a tax on them.

NEW DEPENDENCY RULE

Under the old law, when an employee had earned $600 he could no longer be claimed as a dependent by anyone.

The new law: an employee can earn any amount during the year and still be claimed as a dependent by a parent or other eligible person — if the person claiming the deduction furnished more than half the dependent's support, and the dependent was (1) less than 19 years old, or (2) was a full-time student.

This means that you can pay a student more than $600 for a summer's work without his losing his right to be a dependent. This is intended to eliminate cases in which a student works until he earns just under $600, then quits so as not to lose his rights as a dependent.

CONTRIBUTIONS TO CHARITY

Suppose that in 1952 you paid 5% of your corporate income to charity, and that in 1953 you had a net operating loss you wanted to carry back to 1952. Under the old law, you were required to recompute your allowable charity deduction after applying the loss carryback, which then made part of your 1952 charity contribution subject to Federal taxes.

The new law: allowable charity contributions for prior years are not reduced by carried-back loss. You can also carry forward for the next two years any contributions in excess of the preceding year's 5% limit.

Of course, such succeeding years are still subject to the "5% rule."

ACCRUAL-BASIS INCOME

Under the old law, all income received in a given year was taxed as though payable and earned in that year.

The new law: you now have the right to report prepaid income as earned, instead of as received, up to six years ahead including the year received.

If, for example, you are paid for five years ahead for work to be done in five equal instalments, you can now report income spread out over the five years — the way you earned the money. This applies especially to such services as maintenance and leasing contracts, where prepaid income is likely. If you had a prepaid 10-year-lease, for example, you could report this income in six equal instalments over a six-year period.

Without the tax commissioner's consent, the period over which the income can be spread cannot exceed the taxable year plus the five succeeding years.

If the money received is for a service that lasts for less than six years, the income should be reported year by year — in proportion to the amount of service rendered during each of the years. This applies only to amounts received after January 1, 1954.

If you elect to report any prepaid income "as earned," you must list *all* such income from that particular business. If a taxpayer is in more than one business, he can elect to treat only one of his businesses in this manner. Forthcoming Treasury regulations are expected to define "one business."

Also, an accrual-basis company may deduct additions to reserves for estimated future expenses, such as depreciation, bad debts, and any amounts reasonably susceptible to accurate prediction. This will reduce taxable income by the amount of such deductions.

Important: Treasury Regulations will define what is "reasonably susceptible" to prediction.

Consent is not required, but once you have deducted such additions,

you must continue to deduct them.

This option can be taken without consent for the first taxable year after 1953 in which you receive such income. If this option isn't taken in the first such year, it can be taken later only with the consent of the tax Commissioner.

ODDS AND ENDS

- Regarding rate extension, the new law extends the present normal corporate tax rate at 30% for another year. The old law would have cut the rate to 25% automatically as of April 1, 1954, but the new law provides for this rate cut as of April 1, 1955.
- Under the new law, only one corporate officer is required to sign a return, rather than the two officers formerly required.
- In preparing returns, figures can be rounded to the nearest dollar. This applies to amounts listed anywhere in the return. But it does *not* apply to figures used in preparing the return.

ABOUT TAX REGULATIONS AND SPECIFIC RULINGS

How does the government arrive at tax regulations? The mechanics of regulation writing and rulings are these:

- **A tentative regulation is drafted and published in the Federal Register, together with a date for a public hearing pro and con on its provisions.**
- **Taxpayers may either attend the hearing, or may express their views in a letter to the Commissioner of Internal Revenue, Washington 25, DC. If there are no protests or suggestions within 30 days, no hearing is held.**
- **After the hearing, if there is one, the regulation is drafted in final form and takes effect when signed by Treasury Dept officials. The regulation is then re-published in the Federal Register.**
- **Then taxpayers may submit specific tax problems to the Internal Revenue Service, and get in return a specific ruling which is then attached to the tax return. The most important rulings will be published in the Internal Revenue Service's Bulletin.**
- **A taxpayer does not have to accept a ruling as final. He may make out the return the way he wants to — but he'd better be ready for an argument. Nevertheless, rulings do not have the weight of court decisions.**

CHEMICAL REACTION: The Grinder's Friend or Foe?

That's a question brought up at ASME's Fall Meeting. The answer: it can be either. Chemical reaction speeds up metal removal — also wheel wear. Good practice demands the right balance of both

MILWAUKEE — Chemical reactions between abrasives, coolants, work, and atmosphere can have a variety of effects on lapping, honing and polishing operations, as well as grinding. Those are the findings detailed by H R Letner, Senior Fellow, Mellon Institute, in a paper presented here at the Fall Meeting of the American Society of Mechanical Engineers, September 8-10.

An Example: Titanium

An example of possible chemical reaction on abrasives — grinding wheels have been reported to "dissolve" rapidly into titanium, causing much faster wear than would ordinarily be expected. Mr Letner maintains that other and more-common metals do the same thing.

Relative hardness of the abrasive and the work is commonly believed to be the determining factor in the rate at which dulling or glazing occurs. But now, according to Mr Letner, there is evidence that chemical reaction between the abrasive and the work is also a factor. Take for instance, boron carbide (2800 Knoop) and silicon carbide (2500 Knoop), both harder than aluminum oxide (2000 Knoop) but they both dull faster on steel than the latter.

This difference is believed to stem from the greater solubility of the carbide abrasives in steel. Conversely, when grinding glass, aluminum oxide dulls at a rate too high to be explained by the relative hardness of the abrasive and the glass. The penetration hardness of glass is much lower than that of aluminum oxide — it is even lower than that of hard steel.

Thus, when stock removal is the chief concern, aluminum oxide is used to grind steel, and silicon carbide grinds glass. But when burnishing is needed to provide luster, dullness of grain is important, and the choice is reversed.

Effect of Atmosphere

In the same sense, the glow of the spark stream during grinding doesn't indicate chip temperature. Rather, it is the result of chip material heat plus atmosphere. Oxygen appears to speed metal removal. Proof: no sparks are seen when steel is ground in an atmosphere of pure nitrogen or helium — but you need as much as 25 times the amount of power you do with oxygen.

There are two schools of thought on polishing, Mr Letner said: (1) that abrasive grains are multipoint cutting tools that produce microscopic chips, and (2) that polishing is primarily plastic flow of surface material to form an atmosphere layer. These views are not irreconcilable, Mr Letner concluded—polishing is a complex blend of chip removal, plastic flow and chemical reaction.

EDITOR'S NOTE: complete coverage of other metalworking topics at ASME's Fall Meeting will appear in the next issue.

TRADE WITH RUSSIA: the Lid Is Off on

Now it's possible to ship small, simple millers, lathes and grinders Behind the Iron Curtain. But the Commerce Dept's thumb is still turned down on spar and skin millers, profilers and other advanced machine tools — in fact any complex equipment that could materially help the Reds' military output

WASHINGTON — The Commerce Dept, in line with a general relaxation of US export regulations, has knocked out restrictions on about 30% of the metalworking equipment formerly under US export controls. This action stems from a recent Paris agreement between the United States and 15 other Free World countries on Soviet Trade Policy (for details see *AM* Aug 16 '54 p165).

In general, equipment affected by the relaxation of controls takes in small milling machines, lathes and grinding machines that "incorporate no advanced technology," and are produced in ample quantities Behind the Iron Curtain.

Still on the Commerce Dept's "Positive List" (positively no, you can't ship them, that is) are 81 metalworking machines, parts and accessories considered basic to mass production of military and other strategic goods. These still require licenses for shipment to most friendly countries—and they certainly can't be shipped to the Soviet Bloc. Items not on the barred list can now be exported to friendly countries without license. And, most likely, they can be licensed for shipment to Russia and her satellites.

Narrower Definitions

Control relaxations on metalworking equipment stem mainly from new and narrower descriptions for machines on the banned list. Here are some of the most important changes between the old list of banned goods and the new:

- All engine lathes except light-duty and bench types were embargoed under the old list. Now, engine and center lathes with more than 18-in. center height and 18 ft between centers are banned.
- Milling machines not elsewhere classified were embargoed under the old list. Under the new list these are embargoed: aircraft skin-milling machines with 6-in.-and-more work diameter at the thread; spar millers; planer milling ma-

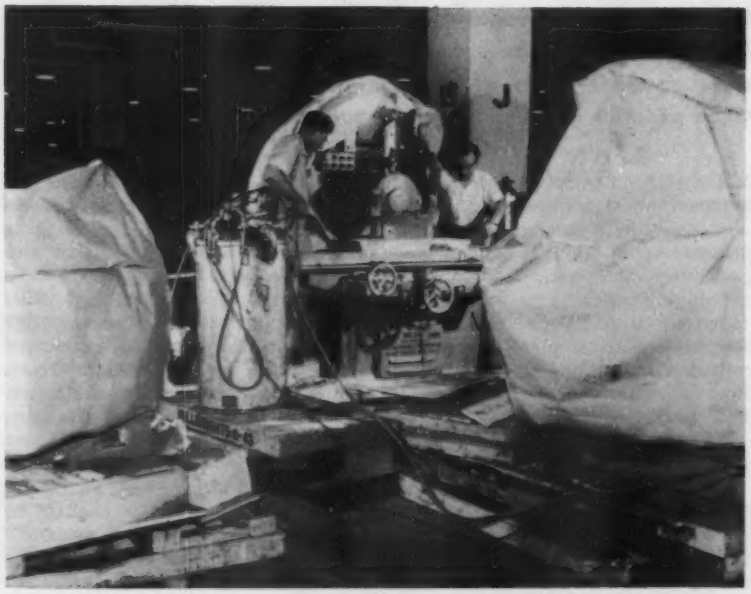
Chrysler-Run Michoud Tank Plant

2400 MACHINES KEPT READY TO GO

NEW ORLEANS — The Army's tremendous 43-acre tank engine production center — the Chrysler-managed Michoud Ordnance Plant here — is the latest and largest defense manufacturing installation to go on standby. At its peak, from June 1951 through this March, the plant employed 2250 people to make 810-hp Continental tank engines.

In contrast to the usual mothballing of defense equipment, all of Michoud's 2400 machine tools are kept in top operating condition — ready for instant use. Each machine is cleaned, oiled and test run regularly, and all defective parts are replaced or repaired. Conveyors, hoists, hydraulic lifts and electric motors are also test run at intervals.

As a result, Michoud can begin machining operations within just a few days, and can be in full production within weeks after a national emergency is declared.



Machines from suppliers are mothballed . . .

CHRYSLER MOTHBALLED SOME 300 MACHINES FOR ITS SUPPLIER FIRMS. Here they are coated with heavy grease, sprayed with corrosion-inhibitor crystals, then sealed in a cocoon of wire mesh, paper and gelatine

30% of Once-Banned Metalworking Equipment

chines and combination planer and planer-milling machines with workpiece capacity of 48-in.-or-more wide, or 15-ft long and over; dieskinning machines; profilers for marine and aircraft propellor blades; profiling and duplicating milling machines; horizontal-spindle, bed-type automatic milling machines with tables 20-or-more in. wide and/or 48-in. long and over.

• Shipment of all internal grinding machines was prohibited under the old rules. Now these are banned: internal grinding machines incorporating high-frequency (over 60 cycles) spindles, and spindle assemblies; internal cylindrical grinding machines; grinders with such automatic features as centerless grinding, automatic feed or sizing.

• Previously embargoed were other metal grinding machines that met National Electrical Code specifications — with the exception of bench and pedestal grinders valued at less than $250. Now these are banned: automatic vertical turret lathes, nonautomatic vertical turret lathes with 72-in.-and-over table diameters; horizontal turret lathes of 4-in.-or-over bar capacity, or swing-over-bed of 24-in. or more.

Some Unrestricted Machines

Some machines have been entirely removed from the restricted list, among them; pipe and nipple threading machines, external cylindrical universal grinders; shapers and slotters; radial drilling machines, plain and traversing types with 13-in. columns or over; and shaving machines, except gear.

In general, these items are still under embargo:

• All machines and equipment especially designed for the manufacture of arms, munitions and the implements of war; jig borers, contour profile grinders; jig grinders, lap radial grinders, thread-grinding machines; spar millers, armor-plate planers, all jigs that have possible military usage.

• Large, advanced or specialized types of: vertical boring and turning mills, deep-hole drilling machines and drills; internal, cylindrical, surface and roll grinding machines; grinders for broaching machines; turret lathes; combination tube-boring-and-turning, automatic, spinning and engine lathes; thread-milling machines; combination millers and planers; forging hammers, presses; wire, tubing and strip machinery; and machines for plate working, metal cutting, broaching, gear making, honing and lapping, profiling, and duplicating.

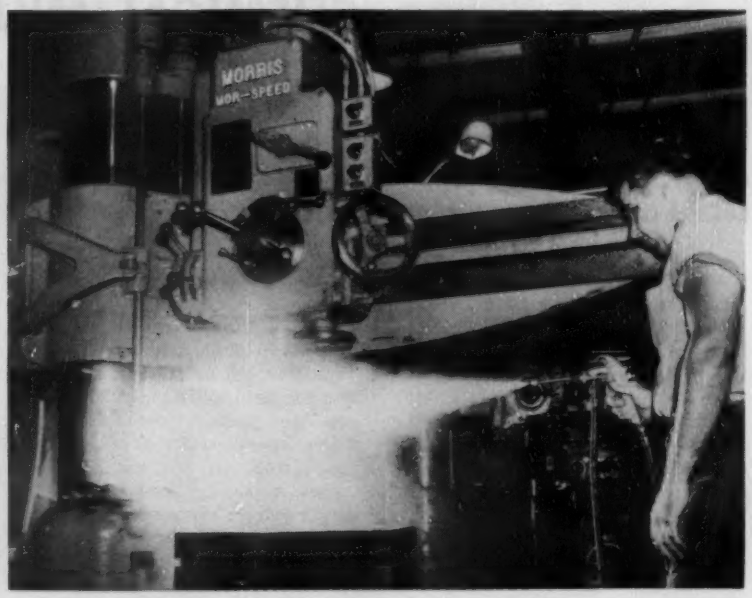
Cuts Export Red Tape

Actually, Commerce Dept officials look at the new rules as a way to cut red tape for US exporters — not as a means to boost US trade Behind the Iron Curtain.

Is Largest to Go On Standby

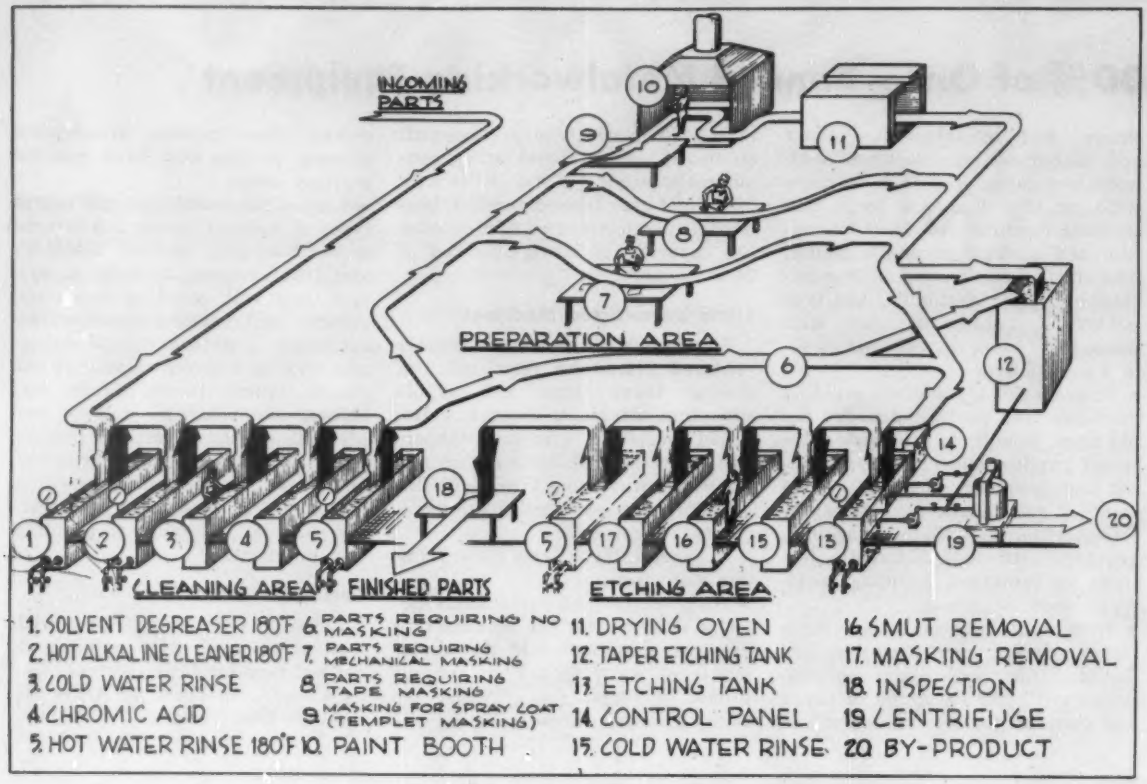
but Michoud's own . . .

SOME 2400 MACHINES ARE MAINTAINED in top operating condition by a work force of 115 men



are kept ready for instant use

STANDBY MACHINES FOR TANK-ENGINE MANUFACTURE are sprayed periodically with a heavy, rust-preventive oil, and each is run from time to time to keep it in perfect operating condition. Humidity is kept under 50% at all times



CHEMICAL MILLING: Now the

North American Aviation's new etching process relief mills aircraft sections and forgings into shapes that have always been considered impossible. And it's fast and cheap, too

DOWNEY, CALIF—A new chemical etching process developed here by North American Aviation's Materials Research and Process Development Group has cracked one of aviation's toughest nuts—the extremely difficult, costly and time-consuming sculpturing of aluminum sections to cut down vital airframe weight. Briefly, chemical milling consists of masking the areas in which the original thickness is to be retained, then etching away the metal from the unmasked areas.

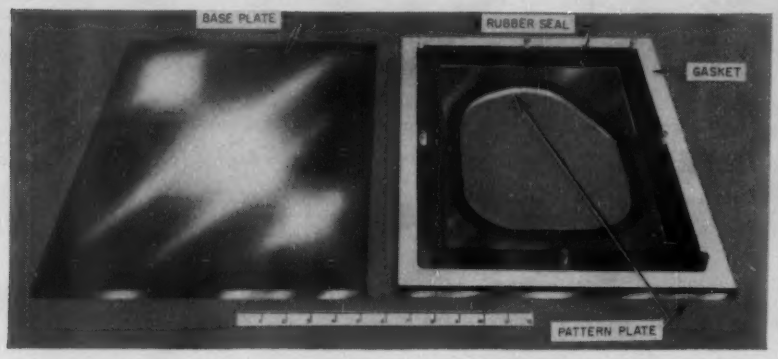
Cost of the equipment is only about 7% of the cost of the skin milling machines that perform equivalent work. Tolerances are readily held within ± 0.002 in., as against ± 0.010 in. for machining, and physical properties of the metal are not impaired.

Chem-milling is readily performed after forming operations, where machining would be difficult and could, at best, be applied only to slightly contoured parts. There are no limits as to shape, direction of cut, or limiting radius of cutters. Complex shapes, broad or narrow cuts, and comparatively sharp corners are possible in a single operation, and metal may be removed from either or both sides of a sheet, avoiding the warpage that results from the inability to machine two sides simultaneously.

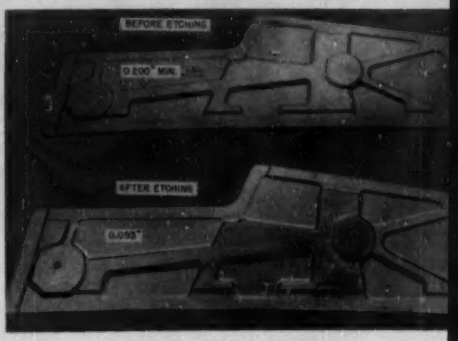
Lighter-weight structures can be produced by creating integral stiffeners without riveting or welding, and these can be curved or contoured to direct the transfer of stress where desired. Parts can be tapered, or various depths of cut can be made on large areas by progressive unmasking.

When properly performed with suitable etchants, no further finishing is required, skilled operators are not needed, and the process can be automated by electronic instrumentation. Surface finish obtained is about 50 to 60 mu in. rms. The equipment is simple and much of it is already in place in most aircraft plants for conventional pickling and cleaning operations. At the present stage of development, the depth of cut is limited to about 0.5 in. because of the tendency to entrap gas under the edge of the mask. This, however, may be avoided by mechanical agitation of the work in the bath.

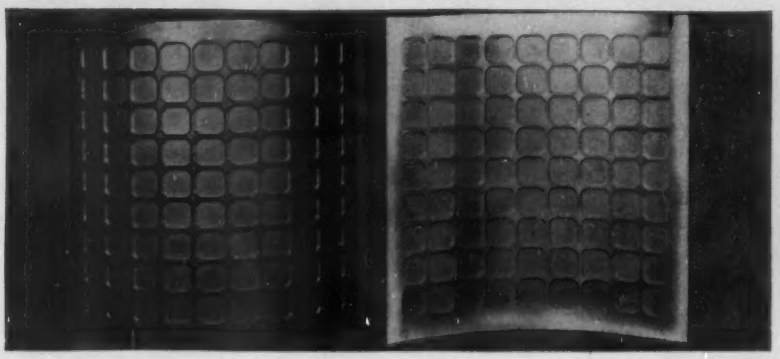
Success, from both a mechanical and economic standpoint, of the operation depends almost entirely on the preliminary masking. The simplest method, which can be applied to parts which do not have cross ribs



MECHANICAL MASK is suitable for etching work flat or with simple curvature



WEB THICKNESS OF 0.020 IN. is readily reduced to 0.093 in. by etching



PHOTOSENSITIVE ORGANIC MASKING created this matched skin

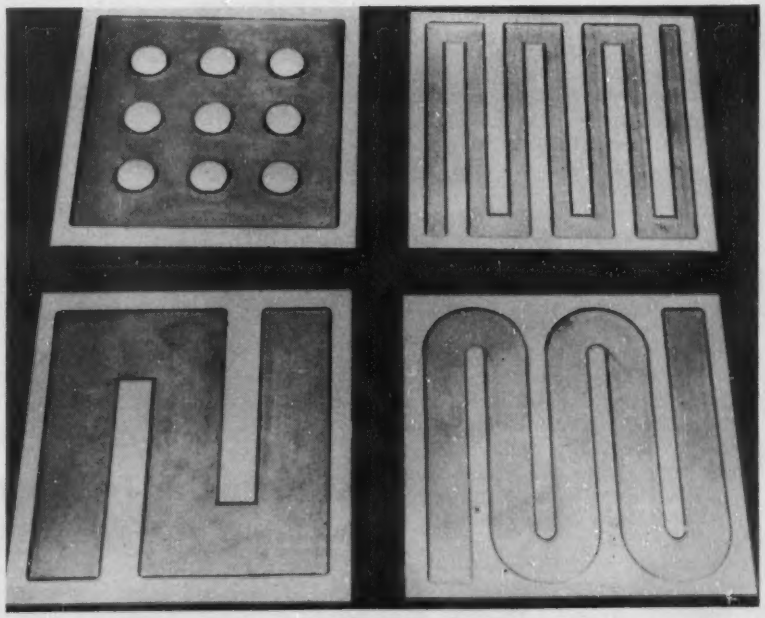
SCULPTURING this complex contoured panel produces no warpage when Chem-milling is employed

"Impossible" Doesn't Take Longer

or stiffeners and which have only simple curvatures, consists of applying a mechanical mask or templet made of chemical-resistant materials. The pattern plate and a rubber seal have the design cut out and are held against the working face of the work by clamps, bolts, or other means. The unetched side is backed up to a baseplate.

For parts with varying depths of cut, chemically resistant adhesive tape is particularly effective, as it may be stripped off progressively after etching has started on the deepest sections. Other masking operations can be performed by spraying or brushing with chemical-resistant organic coatings, using a suitable mask or stencil; applying a mask by the standard silk-screen process, using a specially compounded semi-liquid pigment; masking with photosensitive materials in conjunction with a glass cloth negative; and masking by selective copper plating.

The amount of metal removed can be checked by removing the work



DIFFICULT TO MILL, these forms are simple when Chem-milled

Chemical Milling (continued)

(or a small sample of identical material) from the tank at regular intervals and measuring with a micrometer. For production work, however, electronic controls are being produced to ring an alarm or trigger a mechanism to remove the work from the tank when the desired depth of metal has been removed. For accurate tapers, electronic devices will control the rate of immersion or emersion from the tank, and a new control is now undergoing test to govern the etching rate and chemical concentration of the solution.

Where no masking is involved, the cost per pound of aluminum removed is $0.27, as against a conservative $1.00 for machine milling, based on a cost of $0.18 per pound of etchant.

For mechanical masking, the cost of the tooling and the labor for clamping and unclamping must be added, but tool costs are low and the tools do not deteriorate in the solution. For tape, spray, and silk-screen masking, there is the cost of the material, plus the labor for applying and stripping.

A preliminary cost survey on a production part chem-milled by spray masking showed $9.36 for chem-milling as against $25.00 for machine milling performed at NAA, or $80.00 per part in 60- to 150-piece lots machined by a subcontractor. Costs by the photosensitive masking are not available.

Equipment Costs

From a production standpoint, it is estimated that three milling machines would be required to do the work of one etching installation. These would cost $600,000. The etching installation, even if purchased complete, would amount to only $30,000. And if an existing paint spray booth, and existing cleaning equipment can be incorporated into the line, the cost would be substantially reduced.

Space requirement for the complete setup is about 5000 sq ft. Only one vertical tank is needed for tapering, as the etching solution can be returned to the horizontal tank while the work is being spray rinsed in the same vertical tank. Or, if both tanks are to be in constant use, rinsing and other operations can be continued in the horizontal tanks.

Permission to use the process can be obtained under license available from Turco Products Inc, Los Angeles, Calif.

Pressed Metal Institute Meets

New markets — and the new tools and sales tools that will help capture those markets — were the No. 1 topics on the agenda at PMI's annual meeting in Canada

MURRAY BAY, CANADA — Shop talk and relaxation were merged here at the Manoir Richelieu in the nine-day combined annual meeting and cruise of the Pressed Metal Institute. The meeting began September 4 with a brief afternoon sightseeing tour of Montreal, then members boarded a boat for Manoir Richelieu. En route, committee meetings were held.

The following day, PMI's board of directors and several committees held sessions, followed by a general reception. Actual business sessions began on Monday morning September 6 with a report on how the British stamping industry has put into practice the US techniques learned by British productivity teams.

Ways of merchandising stampings were the subject of discussions at September 7 sessions, including case histories of how firms are planning their products to meet business expansion, market trends, how to increase business in the face of an expanding market, and ways of increasing sales.

Wednesday September 8 was given over to future plans for the industry, including a 30-minute "off the cuff" round table on capital equipment spending and intelligent utilization of manpower. In the evening the Institute held its annual banquet and presentation of merit certificates and safety awards.

The remainder of the meeting was given over to a two-day cruise of the historic Sanguenay River.

PANGBORN OBSERVES GOLDEN ANNIVERSARY

HAGERSTOWN, MD — Two days of events commemorated the 50th anniversary of the Pangborn Corp, manufacturers of metal cleaning equipment, here on September 1 and 2.

On the company's official anniversary date, September 1, open house was held for the people of Hagerstown and friends of the company. From noon until 4 pm, tours were made through all departments, with work proceeding as usual. Then employees and visitors watched an employee unveil a tribute to Thomas W Pangborn and his brother John C, founders of the firm — a gift from Pangborn workers.

Special entertainment was featured on Employees' Night September 2 and was presented on a stage in nearby Pangborn Park.

Kearney & Trecker—Planemakers

THIS IS THE "ROYAL GULL," a gull-wing, twin-engine amphibian manufactured and distributed by Royal Aircraft Corp, new wholly owned subsidiary of Kearney & Trecker Corp, Milwaukee machine-tool manufacturer. Airframe and wings are made in Italy, shipped to Milwaukee for final assembly. The first Royal Gulls will come off the line in a few weeks, and a gradual build-up in production will follow. Its price tag: $65,000 to $70,000

AERIAL VIEW OF CINCINNATI-NEDERLAND NV, Cincinnati Milling Machine Co's ultramodern Dutch subsidiary. Tents in foreground are for open house

"DOOR TO THE FUTURE" is opened by Prince Bernhard in ceremony

Cincinnati Milling Opens Dutch Plant

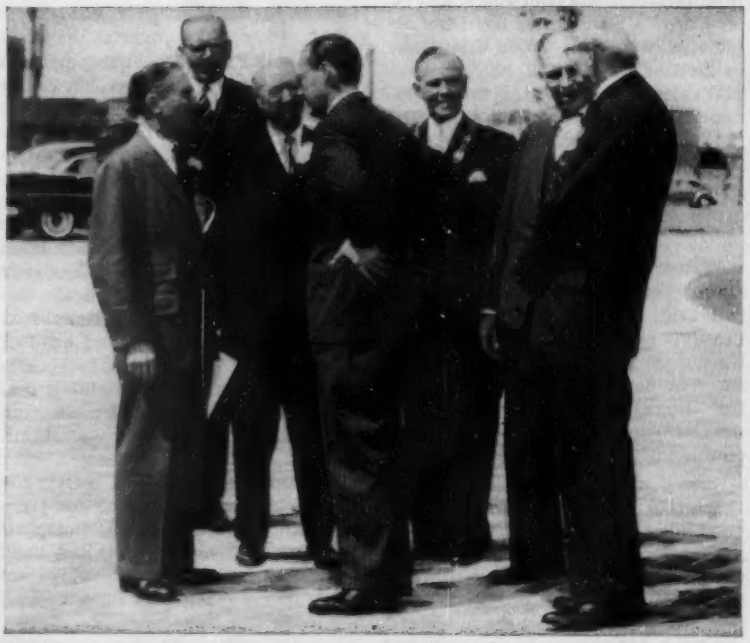
The day Cincinnati came to Vlaardigen, to be welcomed by Prince Bernhard himself, meant: for Holland — more jobs and a strengthened economy; for Cincinnati Milling and the US machine-tool industry — a front-row seat in Europe's market place

VLAARDIGEN, THE NETHERLANDS—Europe's most modern machine-tool plant — Cincinnati-Nederland NV, subsidiary of Cincinnati Milling Machine Co — received a royal welcome from Prince Bernhard and the people of Holland on its opening day here in June. On hand for the plant's dedication by Prince Bernhard were US Ambassador H Freeman-Mathews, Dutch trade ministers, top officers of the parent company, headed by President Frederick V Geier—and the Burgomaster and people of Vlaardigen, to whom the opening of the giant US-owned machine tool plant means jobs and prosperity.

Organized in 1952

Cincinnati-Nederland NV, headed by President-Director Millard Romaine, was organized in 1952 as a means of improving Cincinnati machine tool sales and service in Europe. Actual operations were started in June 1952 in temporary quarters, and the first made-in-Europe Cincinnati machine was shipped on September 11, 1952. Now, many machine tool components are shipped from the parent company in Cincinnati to be built into Vlaardigen-made machines.

Said Mr Geier in welcoming the people of Vlaardigen, "This new Cincinnati plant is here because we believe in the future of our Netherlands company, not only as contributing to industrial progress, but to your community life as well."



INFORMAL CHAT BEFORE THE DEDICATION CEREMONY brought together (from left) Cincinnati's president Frederick V Geier; Dr F A de Graaf, secretary to Prince Bernhard; Cincinnati-Nederland president Millard Romaine; Prince Bernhard of the Netherlands; J Heusdens, Burgomaster of Vlaardigen; Dutch Commissioner L A Kesper; and Cincinnati executive vice president Walter W Tangeman

Kenneth P Martin

Joseph E Smith, Jr

W H Blackburn

Names in the News . . .

Kenneth P Martin, formerly sales manager of Cincinnati Milling Machine Co's Process Machinery Div, has been appointed general sales manager of National Automatic Tool Co, Richmond, Ind. Mr Martin was part owner and general manager of Hydroform Corp, and developed the machine of that name.

William S Blakeslee has been appointed director of government relations—defense operations, Chrysler Corp. Mr Blakeslee has been associated with Gar Wood Industries in Detroit since 1936; he was general sales manager at the time of his appointment. Much of his time during recent years was spent working with the Government in connection with special equipment made by Wood for the armed services.

Walter F Larson has been appointed chief engineer, and **Donald E Russell** sales manager of the new hydraulic equipment department of Sutton Engineering Co, Bellefonte, Pa. The department has been set up for the manufacture of extrusion presses and auxiliary hydraulic equipment.

Captain Robert E W Harrison, USN (Ret), has been appointed director of special engineering projects for Sintercast Corp of America, New York. Captain Harrison, who holds numerous patents on industrial mechanisms and processes, will aid in the development of refractory carbides and powder metal parts for industrial and military uses in which wear and heat resistance are major problems.

Joseph E Smith, Jr, has been made manager of Bryant Chucking Grinder Co's Gage & Spindle Div. His responsibilities include coordination of sales, engineering, and manufacturing of the company's gage product line and rotational equipment for special industrial applications. Mr Smith has been serving as special assistant to the works manager and the chief process engineer since joining the organization a year ago. Prior to that time he was assistant factory manager of SKF Industries.

J Robert Pauline has been appointed vice president of American Brake Shoe Co's Kellogg Div, Rochester, NY. Mr Pauline joined the company in 1943 as an engineer; he moves up from the post of division works manager.

Albert W Cook has been named chief project engineer of Goodyear Aircraft Corp's wheel and brake development department. **Donald G Smellie** has been appointed head of the research and development section, and **Charles F Luginbill** has been placed in charge of all testing activities and laboratory operations.

Ranald M Garrison has been made manager of manufacturing for Hanson-Van Winkle-Munning Co, Matawan, NJ. Mr Garrison has been engaged in design and development work in the machinery field, as well as production supervision.

M F Shearer has been named assistant sales manager for the Hamilton Tool Co, Hamilton, Ohio. He has been sales engineer for the company for the past four years.

W H Blackburn has been named to the newly-created post of assistant to the president of Billings & Spencer Co of Hartford, Conn. Mr Blackburn joined the firm in 1937, was appointed purchasing agent in 1940, and production manager in 1951. He will continue his duties in those capacities in addition to special assignments in his new post.

Victor G Raviolo has been made director of Ford Motor Co's newly-established Lincoln-Mercury car engineering office. The Ford car and truck engineering office has been set up with **H A Matthias** as head. Additional organizational changes announced: **R F Kohr,** director of the general engineering office; **H C Grebe,** director of the body engineering and styling office; **H G English,** executive engineer, transmission and axle engineering; **N L Blume,** executive engineer, Lincoln and Mercury car engineering; **Eugene Bordinat, Jr,** chief of Lincoln and Mercury styling; **F E Sandberg,** executive engineer, truck engineering; **Frank Q Hershey,** chief of Ford car and truck styling; **W E Burnett,** executive engineer, Ford car engineering; **Robert Stevenson,** executive engineer, engines; **P H Pretz,** executive engineer, vehicle testing.

Robert L Lewis, formerly assistant manager of manufacturing control at Temco Aircraft Corp, Dallas, has been named assistant director of contract administration. He succeeds **E Fred Buehring,** made plant manager of the overhaul and modification center at Greenville, Texas. Mr Lewis joined the company in 1950 as supervisor of manufacturing analysis, and last year was appointed to the post he held at the time of his promotion.

Ronald K Evans

Harry J Klinger

David W Davenport

Ronald K Evans, executive vice president and director of General Motors Corp, retired Aug 31 after 34 years with the corporation. He also retired from membership on GM's Operations Policy and Administration committees. Mr Evans joined the organization in 1920, and in 1924 was sent to Australia as field representative. In 1926 he joined the GM Overseas Operations staff in London, and later that year was made regional director for Europe. In 1927 he was elected a vice president of the Overseas Operations Div. In 1929 Mr Evans became managing director of Vauxhall Motors, Ltd, and the following year was named general manager of Adam Opel A G in Germany. He was appointed a GM vice president in 1936. **Harry J Klingler** has retired from his post as GM vice president and director, and group executive in charge of the passenger car divisions. Mr Klingler was also a member of the Operations Policy and Administration committees. As group exectuive since 1951, Mr Klingler supervised operations of the Chevrolet, Pontiac, Oldsmobile, Buick, and Cadillac divisions. He became a vice president in 1942 and was elected to the board in 1950.

Aubrey H Milnes has been named executive vice president of the Steel Improvement & Forge Co, Cleveland. He was formerly vice president and works manager. **Douglas T McGinty** has been appointed assistant to the president. He has recently been serving as officer in charge of the office of Inspector of Naval Materials, Springfield, Mass.

A W Morgan, formerly executive vice president and general manager of Pachmayr Gun Works, Los Angeles, has joined Convair-San Diego as assistant to the manager.

Virgil C Rice has been appointed director of manufacturing of Borg-Warner Corp's Norge Div, Chicago. He replaces **Stewart S Battles,** who has resigned. Mr Rice was a Norge executive from 1927 until 1943 when he joined Avco Manufacturing Corp as vice president and director of manufacturing of the Bendix Home Appliances and the American Kitchens Divs.

James A Vaughn has been named president and general manager of the Vaughn Machinery Co, Cuyahoga Falls, Ohio. Formerly vice president, he succeeds **L A Vaughn,** who has headed the company since 1929, now elected chairman of the board. **Gordon C Vaughn** has been elected vice president, manufacturing, and **Eugene Daugherty,** vice president, sales. **E J McIlvried** has been named senior vice president and director of engineering. **Maurice A Nye** has been appointed chief engineer, and **James E Spearman** has been named assistant to the president. **Dale R Knouse,** formerly associated with the aluminum Co of America, has joined the sales engineering staff.

L C Schweitzer has been named assistant general manager of the Ohio Crankshaft Co's TOCCO Div. Mr Schweitzer joined the company in 1939. He established the division's first sales office in Chicago, and served successively as sales engineer, district sales manager, and district manager, the post he held at the time of his appointment.

Walter E Jones, metallurgical development engineer at the Thomson Laboratory of General Electric Co, Lynn, Mass, has been appointed manager of vacuum melted products engineering at GE's Carboloy Dept, Detroit.

David W Davenport has been appointed sales manager of the S-P Manufacturing Corp, Cleveland. Formerly assistant, he takes over the sales duties of Vice President D Lee Bassett.

Hans M Larsen has been named to the newly-created post of director of purchases and production planning for the Louis Allis Co, Milwaukee manufacturer of electric motors and generators. Mr Larsen has been with the company for 35 years in various capacities, most recent of which was production manager.

OBITUARIES

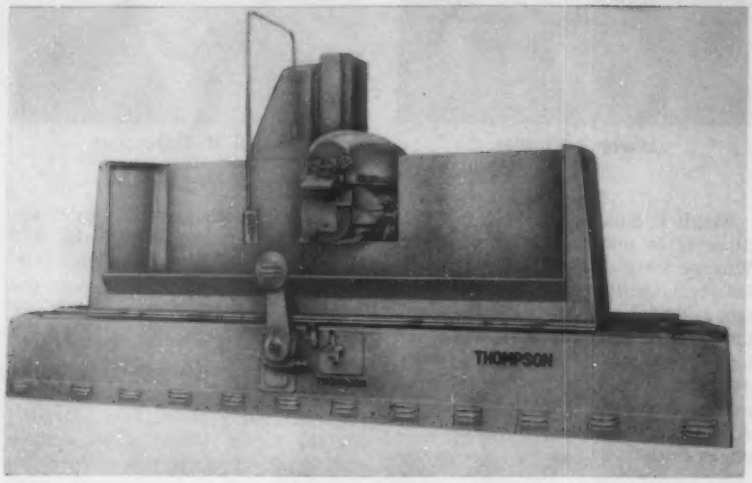
Robert J Stack, president of National Automotive Fibres Corp, Detroit, since 1951, and a member of the organization since it was founded in 1928, died Aug 16 at Au Gres, Mich.

Erich C Wollaeger, manager of the Cleveland and Cincinnati offices of The Oilgear Co, Milwaukee, died recently at the age of 62. Mr Wollaeger joined the firm 28 years ago, during 27 of which he was associated with the Cleveland territory.

Abran Peters Steckel, 75, known throughout the metalworking and steel-making world for his process of cold rolling steel, died in Youngstown Aug 19. Mr Steckel developed the process in 1922, and made it available to industry in 1926.

Angus C Woodbridge, 88, pioneer automobile body designer, died Aug 18 at his home in Detroit. Mr Woodbridge came to Detroit in 1884 from Canada, and in 1908 became chief body designer for Cadillac Motor Car Co. Later he joined the infant Lincoln Motors and designed the first Lincoln body. He remained with the company until it was purchased by Ford Motor Co.

New Shop Equipment,



Thompson Line of Hydraulic Heavy Duty Surface Grinders

Thompson type CX hydraulic surface grinders offer power and precision for heavy duty production. While massiveness is the keynote of construction with heavy base and single column design, the Thompson CX reportedly provides rapid removal of stock while maintaining close limits and fine finish.

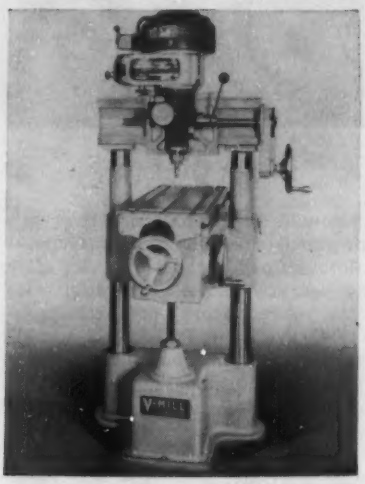
Among the outstanding features are: cross-feeding wheelhead with horizontal spindle grinding with the periphery of a 20-in. diameter wheel; rapid and accurate positioning of wheel to work; simplified, centralized control; accurate quality finish; flame-hardened cross slide ways; rigid work table; "in-position" wheel truing; direct-coupled motor drive to wheel spindle; low pressure hydraulic system; automatically lubricated ways, slides and spindle bearings; separate cooling system; proper weight distribution; way protection; anti-friction elevating nut; non-adjustable steel-back silver-lined front-spindle bearings; simplified electrical control; accessibility; manual cross feed; full range of sizes from 30 x 26 x 72 to 36 x 36 x 24 in. (or larger).

Auxiliary equipment for the CX includes: automatic down-feed; micrometer backup stop; dust exhauster attachment; coolant through wheel; angular wheel truing; auxiliary hand table feed; Hoglund Magniform contour dressers; coolant filter; magnetic coolant separators; wheel balancing ways and arbors; electric double-angle wheel truing; manual fine crossfeed; raised elevation; rectifiers and neutrolators for chuck; demagnetizing switches and motor generator sets. Delpark coolant filters are also available.

The machine illustrated is equipped with auxiliary raised elevation attachment and swinging pushbutton station. The size is 36 x 48 x 120 in. Table speeds of all Thompson CX's are 10 to 100 fpm with vertical feed handwheel graduated to 0.0005 and powered at 15 ipm.

Cross-feed hand-wheel is graduated to 0.001 in. with power 1/32 to 3 in. Hydraulic wheel truing feed is 6 ipm with hydraulic rapid traverse at 240 ipm. Grinding wheel speed is 6000 fpm.

The Thompson Grinder Co, Springfield, OMo



Pierce-West V Mill Features High Capacity

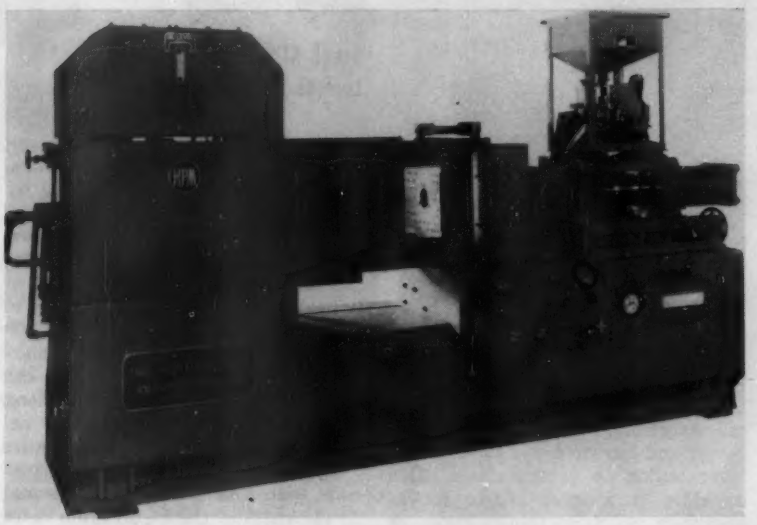
Unit was specifically designed to perform wide range of milling, boring, and drilling operations. It will receive as large a workpiece as possible within a practical floor area of 31x60 in. The table measures 14x36 in., has a 20-in. travel. Clearance between rods is 17½ in. The head has a 16-in. cross travel and a 17-in. vertical travel. Spindle travel is 4 in. Distance from table to spindle range is from 0 to 21 in. Height of table from floor is adjustable from 27 to 44 in.

Speed reductions are accomplished by means of dials located in front of all three handwheels. Dials are engraved with 0.001-in. graduations. Leadscrews are ball-bearing mounted. Eight speeds can be obtained ranging from 120 to 3500 rpm. Quill travel is 4 in.—spindle is of alloy steel with pre-loaded ball bearings. An automatic collet closer and enclosed micrometer depth stop are provided.

V-ways on the table and cross slide are hand-scraped to provide perfect lubrication and straight-line motion. Standard equipment includes 1-hp., three-phase 220/400-volt motor and four universal 20° collets ranging from ⅜ to ¾ in.

Lodding Inc, Dept N 63, 79 Beacon St, Worcester, Mass

Materials and Parts . . .



Automatic Molding Press Needs Only ¼ Operator

Fully automatic 6- to 8-oz-capacity injection molding machine will cycle up to 400 times per hour on small, thin-walled products, such as boxes for metal parts. Straight-line hydraulic mold clamp has fast closing and opening speeds and automatic slow-downs prior to mold contact.

Injection unit is mounted on ways and actuated by a single hydraulic cylinder. Hydraulically actuated positive sprue break can be used at option of the operator.

Plasticizing chamber has three pyrometer-controlled head zones. Thin molds without bolsters can be utilized because of a quick-changing ram spacer. Low-pressure mold protection is provided.

Daylight opening is 20 in., clamp travel 10 in., maximum mold-mounting space 15x20½ in. Machine has clamp capacity of 150 tons and weighs 14,500 lb. Price is in $15,000 range.

The Hydraulic Press Mfg Co, Mount Gilead, Ohio

Combination Cutters Mill, Step-Form, Bore

Alloy-steel milling-cutter bodies use standard carbide or tool-steel bits or salvaged undersize lathe tools. Close tolerances on slots allow toolbit interchangeability. Single socket-head screw clamps split cutter body to grip both bits evenly.

Standard tools may be modified for step milling, boring, undercutting, and other operations. Head diameters range from ¾ to 1¼ in., shank diameters from ½ to 1 in., and lengths from 1¾ to 4 in. Smallest holder costs $9. Both 3/16-in. and ½-in. toolbits are utilized.

Also available are solid- and tipped-carbide toolbits with radial relief.

Econotool Co, Jenkintown, Pa

. . . including

Gear hobbing machine, single-spindle, has production rate equivalent to multi-spindle unit . . . . . page 208

Hydraulic press is provided with interchangeable forcing and straightening tables page 209

Plunge form grinder has completely automatic cycle and controlled dressing . . page 209

Electronic counter overcomes effect of material hardness variations in stretch-forming operations . . . . . page 210

Dry-hearth furnace heats aluminum for die-casting, combines melting and holding baths page 220

Universal drilling machine incorporates cam program control allowing up to 192 indexes page 224

Optical comparator allows easy staging of unwieldy parts within inches of viewing screen page 226

Tool control panels co-ordinate functions and provide automatic counting and signalling devices . . . . . page 230

. . . and in Sept 27

Line of lathes designed for automation, maximum carbide performance, and high rates of metal removal.

Spray-coolant system designed to eliminate dry grinding operations.

High Production Reported For British Gear Hobber

Single-spindle gear hobbing machine, Hydrax, is designed for rapid production of spur and helical gears by either "climb" or conventional hobbing, with a production claim equivalent to that of a multi-spindle machine.

It has a fully automatic cutting cycle operated by a single pushbutton; feeds are hydraulically controlled and steplessly variable; rates up to ⅛ ipr of the work can be obtained without exceeding the limits of accuracy required for subsequent shaving operations. The work axis is inclined to the direction of hob feed at helix angle of gear and hob slide is set at worm angle of hob. When cutting, the hob is traversed in a vertical direction along the helical tooth and the Hydrax method involves a considerably shorter hob travel than is necessary in the more conventional cutting machine. The minimum hob transverse is given by plunge-feeding the hob to depth.

When cutting helical gears, the point of first contact on the hob is some distance from the point where contact ceases. This shift takes place automatically and is due to the contact moving along the hob as the hob feeds through the work. A hand-operated hob-shifting mechanism is incorporated so that hob wear can be uniformly distributed when gears of small helix are cut. Hobs up to 7 in. diameter and 7 in. width can be used and the hob spindle runs at speeds ranging from 84 to 600 rpm.

Hydrax cuts spur gears up to 10-in. face width and 14-in. dia. with a 3-in.-dia hob. Thirty-degree helical gears with a maximum face width of 3-in. and up to 14-in. diameter can be cut with a 3-in.-dia hob. The machine takes hobs from 2½ in. to 7 in. diameter and the maximum pitch is 3 DP. Plunge and vertical feeds from 1/16 to 5 ipm can be obtained.

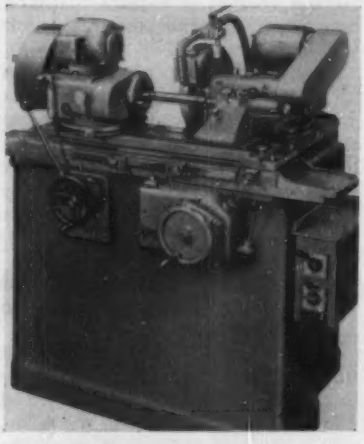
Morey Machinery Co, Inc, 383 Lafayette Street, New York 3, NY

Small Hydraulic Broach Operated by Hand

Low-cost vertical broaching machine can exert up to 2 tons of pulling power and has stroke of 15 in. Hand lever builds up pressure and holds it while each lever stroke moves broach ½ in. Knob release takes off hydraulic pressure and drops broach back into starting position.

The 250-lb unit takes 2¼ sq ft of floor space and costs $395. Unit is intended for short runs or single jobs. The 42-in.-high table will take workpieces of many sizes.

Pioneer Broach Co, 6434 E Telegraph Road, Los Angeles 22



Fast Cylindrical Grinder Does Toolroom Work

Stock up to 4 in. in dia and 12 in. long may be ground by an economical machine with a workhead that accommodates No. 1 Morse centers, live and dead, as well as a 4 in., 3-jaw tapered draw-in chuck, or quick-change collets up to ⅝-in. capacity. Both plunge and traverse-feed grinding can be done with automatic infeed at the stops. Work head speeds vary from 125 to 610 rpm, and the work spindle carries a 12x1x3-in. wheel powered by a 1¼-hp, 3-phase, 60-cycle motor. Machine weight is about 2000 lb, and price is $2850.

American Herforder Co, 1546 N Orleans St, Chicago 10

Steel Slitting Machine Leaves Little Waste

Machine for slitting and edge-rolling with as little trim or waste as the thickness, or less than the thickness, of the steel, has been developed by Golding Manufacturing. A report quoted from Economy Steel now using the machine, states that a quantity of coil steel was slit by the warehouse to 15/16-in. wide, but due to an error it was from 0.0065 to 0.008 in. wider than normal slitting tolerance. Economy Steel reworked the coils and slit 0.008 in. from them, reducing coils to exact width required.

It is stated that slitting of narrow coils with a drop off or scrap equal to thickness of the metal often more than equals the cost of slitting.

Economy Steel Service Co, 1832 West Irving Park Blvd, Chicago 13, Ill

Carbide-Tipped Reamers

Harduty reamers, No. 1407, have carbide tips, HSS bodies, taper shanks, and straight flutes. Tool is designed to ream accurate holes in hardened steel having a R$_c$ 40 scale or higher hardness.

Size range is ¼, 5/16, ⅜, ½, ⅝, and ¾ in. Also furnished in sets (illustrated) consisting of sizes ¼, 5/16, ⅜, and ½ in.

Chicago-Latrobe, 411 W Ontario St, Chicago 10, Ill

CORRECTION:
The description of the fixed position plate accessory for the Commander Multi-Drill (*AM*—Aug 2 '54, p160) contained an incorrect listing of the manufacturer. The correct name is Commander Mfg Co, 4225 W Kinzie, Chicago 24, Ill.

FYI
FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 PRESSES—*E W Bliss Co, Canton, Ohio.* 20-page catalog 9-D illustrates and describes straight side single crank S-1 models with capacities from 50 to 400 tons. Includes data on heavy-capacity, front-to-back shaft eccentric drive presses ranging from 500 to 2000 tons.

2 VARI-SPEED MOTOR PULLEYS—*Reeves Pulley Co, Columbus, Ind.* 28-page catalog V-545 gives detailed information on redesigned standard line for new NEMA frame motors, also usable on old motors. Available in eight sizes from ½ to 15 hp in speed ratios to 4:1.

3 PLASTICS INJECTION MOLDING MACHINES—*Hydraulic Press Mfg Co, Mount Gilead, Ohio.* 12-page bulletin No. 5406 contains illustrated data on line from 6-oz. to 400-oz. capacity.

4 DIAL FEED — *Sciaky Bros, Inc, Chicago 38.* 4-page bulletin 319-12 describes universal, rotary indexing unit for all applications on resistance welders, machine tools, and various assembly operations.

● "SPEEDS AND FEEDS FOR BETTER TURNING RESULTS" — *The Monarch Machine Tool Co, Sidney, Ohio.* 36-page booklet of technical information on machinability ratings, tool angles, coolants, speeds and feeds for wide range of ferrous and non-ferrous alloys. Tables, charts, graphs included. Request direct on company letterhead only.

5 BROACHING MACHINES—*Colonial Broach Co, Harper Station, Detroit 13.* 4-page bulletin RD-54 provides tabulated specification data on nine pull-down models including a new 50-ton, 72-in. stroke unit. Design details and features summarized.

6 ROTARY SWAGER—*The Torrington Co, Torrington, Conn.* 38-page catalog contains illustrated information on line, lists extra equipment for motor drive, feeding fixtures, attachments, and a swager die section.

7 AUTOMATIC DRILL UNIT — *Dumore Co, Racine, Wis.* 4-page booklet describes new Series 24. Specification details included, as well as variety of optional attachments.

8 SHAPERS — *Michigan Tool Co, Detroit 12.* 12-page bulletin 1800-54 outlines Shear-Speed process for cutting gears, splines, cams, sprockets, and miscellaneous external shapers, one or several at a time. Specifications for each model tabulated. Data on tooling, accessories, machine operation, controls, and feeds.

9 TRACER ATTACHMENT—*Azelson Mfg Co, Div, Pressed Steel Car Co, Los Angeles 58.* 16-page illustrated bulletin on hydraulic Trace-O-Matic attachment applied to heavy-duty lathes for duplicating turned parts from inexpensive flat templets. Data on setup, how to make plates and case histories.

TOOLS AND ACCESSORIES

10 INSTRUMENTATION—*Minneapolis-Honeywell Regulator Co, Philadelphia 44.* 13-page bulletin 100-C lists all current Honeywell Industrial Div literature. Numbers and titles of all catalogs, bulletins, specification sheets and data sheets included.

11 HAND TACHOMETER—*Metron Instrument Co, Denver 3, Colo.* 4-page bulletin 103 describes 3 in 1 unit for measuring speeds of rotating parts and moving surfaces; has three separate ranges in one instrument.

12 TOOL LINE—*The Cincinnati Tool Co, Cincinnati 12, Ohio.* 36-page catalog 65 illustrates complete line of Hargrave "Load-Tested" clamps, chisels, punches, and masonry drills.

13 METALLOGRAPH — *William J Hacker & Co, New York 5.* 6-page illustrated folder describes features of Reichert Research Model MeF, including apparatus for testing surface finish of materials, phase contrast for metallurgy, and micro-hardness testing.

14 REVERSIBLE PLUG THREAD GAGES—*John Bath & Co, Worcester 3, Mass.* 4-page folder provides data on features of pin-type and trilock units. Table of sizes, prices and miscellaneous data included.

15 FILES—*Heller Brothers Co, Newcomerstown, Ohio.* Resale catalog 129 contains illustrated folders of information on American and Swiss pattern files, "Vixen" milled tooth files, rotary files, and general tools.

Name .....
Title .....
Company .....
Co. Address .....
.....
AMERICAN MACHINIST, New York — Not good after Nov. 15, 1954

FILL IN BELOW NUMBER OF ONE CATALOG WANTED ( )

(Duplicate of the above coupon, five more times.)

FYI

FOR YOUR INFORMATION

16 WORK-HOLDING FIXTURES — *Swartz Tool Products Co, Detroit 27, Mich.* 8-page brochure, "Advancing Automation," describes in detail company's facilities for designing and building of precision fixtures. Typical units illustrated for variety of machines, with factual data on each.

HEAT-TREATING & WELDING

17 HAND TORCHES — *Air Reduction Sales Co, New York 17.* 36-page illustrated catalog ADC 702B covers line of torches and tips for oxyacetylene cutting and welding. Lists necessary mixers, extensions, adapters, and accessories.

18 HARD-FACING — *Mir-O-Col Alloy Co, Los Angeles 31.* 72-page pocket-size brochure contains comprehensive data and instructions. Special section recommends specific rods for over a thousand pieces of equipment.

19 ELECTRO-PLATING—*US Galvanizing & Plating Equipment Corp, Brooklyn 11, NY.* 17-page bulletin illustrates and describes methods and equipment, including plating barrel apparatus, acid treatment and dipping, still tank plating equipment.

20 SOLDER — *Kester Solder Co, Chicago 39.* 80-page reference textbook on fundamentals and usage. Charts, tables, and photographs included.

21 RESISTANCE WELDING — *Sciaky Bros, Inc, Chicago 38.* 6-page illustrated bulletin "Resistance Welding at Work," Vol 3, No. 7, covers case history of spot, seam, and projection welding of transformer tanks to rigid specifications. Techniques described.

22 STAINLESS STEEL ELECTRODES —*Crucible Steel Co of America, Pittsburgh, Pa.* 16-page data sheet, "Resistal (R) Stainless Steel Electrodes" contains selection data, chemical and mechanical properties of weld deposits, coating fluxes, table of recommended current ranges for ac or dc operation.

23 BURNERS & FURNACES—*Johnson Gas Appliance Co, Cedar Rapids, Iowa.* 29-page catalog 55 describes line for hardening, tempering, and annealing, valves, torches, mixers, blowers and water warmers.

PARTS AND MATERIALS

24 SHADED POLE MOTORS —*General Electric Co, Schenectady 5, NY.* 10-page bulletin GEA-6134 illustrates features and applications of units with ratings from 1.5 w through 1/6 hp. Gives specifications, including dimensions and operating characteristics.

25 12-POINTER NUT —*National Machine Products Co, Utica, Mich.* 12-page brochure gives complete engineering data and prices. Available in comparable dimensions in all popular sizes.

26 TITANIUM ALLOYS — *Mallory-Sharon Titanium Corp, Niles, Ohio.* 4-page booklet provides data on physical properties, forging recommendations, etc, for MST 3A1-5Cr alloy, developed primarily for bar and forging applications. Available in billet, bar, rod, forging, extrusion, or plate form.

27 TAPER-LOCK BUSHINGS, HUBS, ADAPTERS — *Dodge Mfg Corp, Mishawaka, Ind.* 8-page bulletin A-628A contains tabulated information, cross-section drawings, bushing numbers, bore sizes, dimensions, weights, keyseats, list prices.

28 METAL POWDERS—*Plastic Metals Div, National Radiator Co, Johnstown, Pa.* 4-page bulletin 1 provides brief introduction to process of powder metallurgy; describes general types of powder, and large number of grades required for different applications.

29 NICKEL ALLOY STEELS — *International Nickel, New York 5.* 36-page bulletin A-68 contains 70 mechanical property charts showing properties regularly expected in nickel alloy steels in various section sizes. General characteristics of each type described.

30 GROMMETS — *Goshen Rubber Co, Goshen, Ind.* 16-page brochure in file folder form lists sizes and types available. Supplied in wide range of proven and synthetic rubber, and silicone rubber compounds.

31 CALCULATOR — *Ulbrich Stainless Steels, Wallingford, Conn.* Stainless steel strip calculator works on slide rule principle, but is simple to operate. Request on company letterhead.

32 ROLLER CHAINS & SPROCKETS — *Diamond Chain Co, Indianapolis 7, Ind.* 64-page catalog 754 covers complete line. Includes minimum bore sprockets for reboring, as well as finished bore and Taper-lock bushed sprockets ready to use, plus chain selection and application data.

● ALUMINUM DATA BOOK — *Reynolds Metals Co, Louisville, Ky.* 1954 edition contains 220 pages of detailed data on properties and characteristics. Includes table of contents, index of tabular matter, 20-page itemized cross-index. Request direct on company letterhead.

33 ELECTRIC MOTOR CONTROL — *Furnas Electric Co, Batavia, Ill.* 140-page catalog 101 contains engineering and design data, including wiring diagrams. Items listed include magnetic starters and contactors, combination starters, control panels, drum controllers, master, foot and pressure switches.

34 HSS STOCK LIST—*Firth Sterling, Pittsburgh 30, Pa.* 4-page bulletin lists over 800 sizes in five grades of high speed steel.

35 WIRE THREAD INSERTS—*Heli-Coil Corp, Danbury, Conn.* 4-page bulletin 708 presents basic information in condensed form. Illustrations and tables give data and installation instructions on inserts and tools for NC and NF, UNC and UNF, Spark Plug and Pipe Thread Series.

36 SEALED BEARINGS—*McGill Mfg Co, Inc, Valparaiso, Ind.* 4-page bulletin SGR-54 pictures and describes Guiderol bearing construction, functions, uses. Contains tables of dimensions, load capacity, life and speed factors, shaft and housing fits and tolerances.

37 ELECTRIC MOTORS—*General Dynamics Corp, Electro Dynamics Motor Generator Div, Bayonne, NJ.* Brochure 400 is a report on comparative tests of different brands. Data on engineering performance, and charts as to what results prove in relation to use.

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

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American Machinist
330 W. 42nd St.
New York 36, N. Y.

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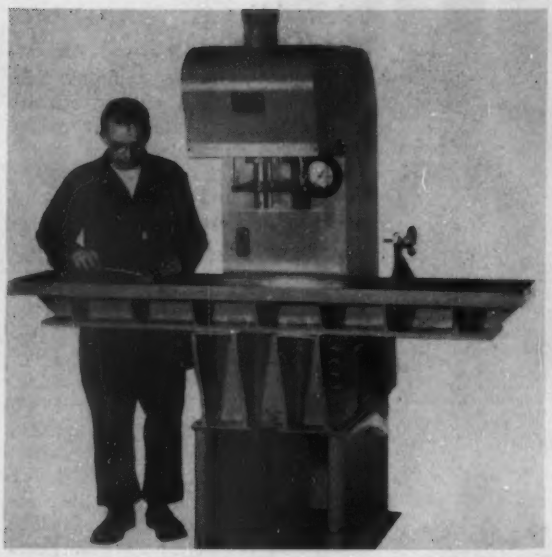
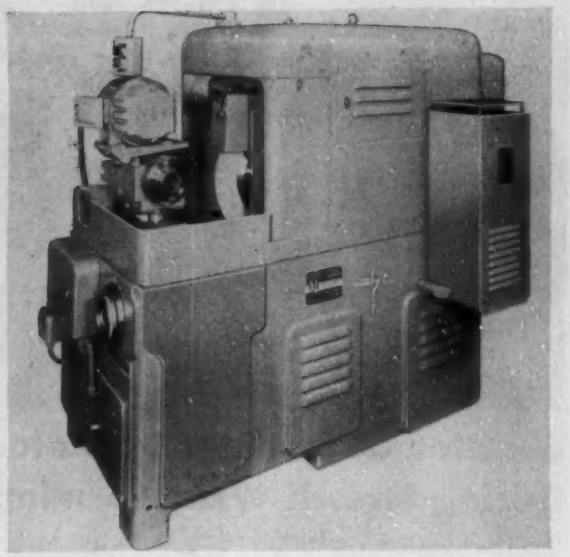




Holmes Press Has Interchangeable Forcing and Straightening Tables

By removing four bolts and replacing one quick-change table with another, press will do either forcing or straightening. Interchangeable manifold has four connections and is held in place by four bolts. Hydraulic valve system can thus be readily removed and replaced.

O-ring gasket-mounted valves eliminate the need for conventional pipes. Oil flows through drilled manifold plate and there is no possibility of between-port leakage. Each valve is removable for replacement. Press also has swing-out motor and pump panel. By removing two bolts, hinged panel can be lowered to horizontal position making motor and pump power unit accessible for inspection.

All-steel welded frame was engineered to provide maximum strength with minimum weight. Ram is precision-machined, ground, and polished with honed cylinder for super fine tolerance and surface finish. Sliding ram guide prevents rotation of ram during fixture setups. Simple ram adjustment provides for any desired stroke. Oil-level gage is of nonbreakable Plexiglas.

Other features include: precision pressure dial calibrated in both psi and total tonnage; multiple control equipment; special fixtures and accessories; and built-in adjustable illumination. Stroke varies on different models from 10 to 30 in.

Stanley H. Holmes Co, 3300 W Lake St, Chicago 24, Ill

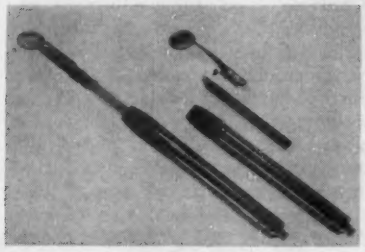
High Production Rate for J&L Plunge Form Grinder

Jones & Lamson announces the new Model E automatic high-production plunge form grinder. Compact design (44x78¼ in.) affords high accessibility and simple setups. Unit is used for chucking work, center work, or shoe-type grinding; crush wheel, or diamond trueing, with automatic or manual handling.

Machine has completely automatic cycle — high-speed approach, wheel feed, sparkout and withdrawal are positively controlled through simple cam action to insure constant uniform operation under all conditions. Wheel slide is held against positive stop with uniform hydraulic pressure for automatic, positive size control. Automatic trueing provides controlled dressing, either once per piece or once per any predetermined number of pieces.

The maximum diameter of swing over table is 12 in. Maximum length between centers is either 8½ in. or up to 32 in.

Jones & Lamson, Springfield, Vt



Three-Way Probe Has Mirror and Light

Plastic probe tip beams light in straight line into small subassemblies.

Small mirror clips onto probe for reflective view or to throw light behind parts. Metal flashlight case uses standard lamp and batteries. Price $2.98.

Moore Mfg Co, Swedesboro, NJ

Tungsten Hard Surfacing Applied With Brush

Tungstide is reported to be a type of metal-cladding which can be applied by anyone to any surface at room temperature, which not only imparts to chosen substrata a hardness and abrasion-resistance almost equal to metallic tungsten, but is self-lubricating as well. Metallic tungsten of near-colloidal particle-size is suspended in hard liquid plastic, and incorporated in the mixture is a hardening form of Liqui-Moly.

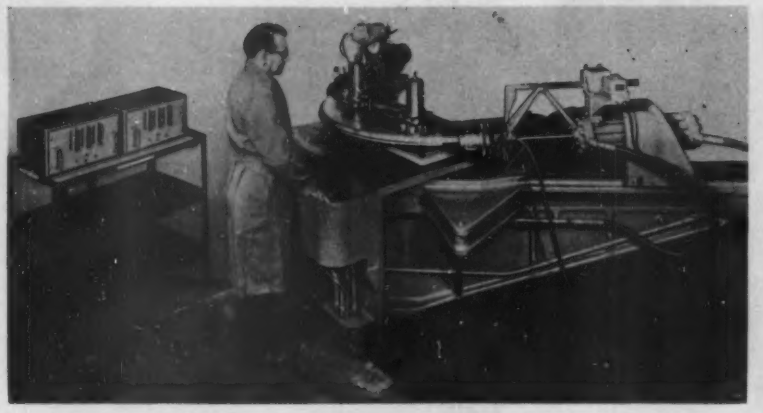
Tungstide coatings are expected to find wide use in the aircraft field for sheet-forming molds and tools, for reducing wear on plastic drilling, assembly, and checking jigs, etc. It is available in various formulations for different uses.

The Lockrey Company, Southampton, New York

Coolant Feed Manifold

Coolant feed manifold is an engineered system for applying coolant to multiple drilling operations. It can be easily mounted on most standard 4 or 8 drill heads—split ring design makes it unnecessary to remove drill head for installation. Coolant is directed to point of drill. Eight removable, adjustable nozzles are supplied with manifold, but it can accommodate 16 nozzles. Nozzles can be removed in 15 sec.

Graymills Corp, 3705 N Lincoln Ave, Chicago 13, Ill



Counter Overcomes Variations During Stretch-Wrap Forming

Electronic counter overcomes effect of material hardness variations in stretch-forming operation. Since degree of stretch has in the past been controlled by pressure exerted, different length of stretch could be produced each time hardness of material varied. To overcome this obstacle a new system of controlling amount of stretch has been developed for use on Hufford stretch-wrap forming machines. Elongation produced to set the contours is no longer proportional to pressure applied; pressure greater than amount needed is now applied. Tension is curtailed when desired lineal increase in work length has been produced.

Mechanism is relatively simple, employing two electronic counters. Attached to each tension cylinder of Model A-5 machine is a mechanical device which measures jaw retraction. This consists of a disk marked with a series of alternate black-and-white lines radiating from the center. The disk is rotated by contact with the sliding arm attached to the jaw. Each 0.1 in. of ram travel causes one white line on the disk to pass an aperture. Light beam reflected by each white line is picked up by photo cell and converted to electrical impulse. Impulses are transmitted to respective electronic counters.

Arriving at desired jaw retraction involves punching stretch on electronic counter keyboard in inches and tenths. When total is counted stretch is automatically halted.

Hufford Machine Works, Inc, El Segundo, Calif

Power Nibbler Has Detachable Crank Case

Power nibbler with detachable crank case also beads, folds, cuts straight or circular and cuts slots, louvers as well as irregular or freehand by simple adjustments with accessories provided at no extra cost. Nibbler mechanism operates in enclosed oil bath. Detachable crank case permits construction of special frames. Reassembly of detachable crank case to any special type of frame is reported to be a simple matter done with standard tools.

Unit is designated Model G Nibbler and patented lower tool-holder makes changing of tools easy because it has the same center-line as the upper holder and a hand wheel makes fine adjustment to any desired setting. Another feature is that it is possible to change from circular cutting to straight cutting without removing the lower slide block. Only the upper slide need be released and removed by sliding to rear.

Range of materials that can be cut is 3/32-in. cold rolled steel to 5/64-in. stainless and 5/32 brass or copper. Largest circle is 28½ in. in dia and smallest 2 23/64 in. in dia. Unit folds to 5/64 in. and beading to 3/32-in. plate thickness can be accomplished.

Nord International Corp, 449-5 Central Ave, Orange, NJ

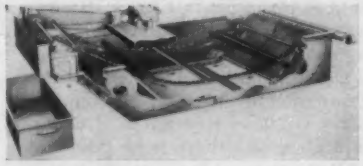
Universal Line Of Pullers

Blackhawk announces complete line of 127 pullers and pulling attachments to fill all maintenance requirements. The thirty two- and three-armpullers spread to hold up to 36-in. diameters and have capacities up to 50 tons. Power-pitched buttress thread enables mechanics to develop 30% more torque according to manufacturer. Lips of pulling arms are reversible for inside and outside pulling. Basic parts are interchangeable between corresponding sizes of two- and three-arm pullers.

Where puller jaws cannot be used, matched pulling attachments with knife-like jaws can be forced behind bearings and gears to apply force of puller. Sheave pulling attachments have thick lips that fit snugly into grooves to pull gears and wheels without damage.

Line includes push-pullers which together with special adapters, can push or pull with capacities to 35 tons.

Blackhawk Mfg Co, Milwaukee 46, Wis



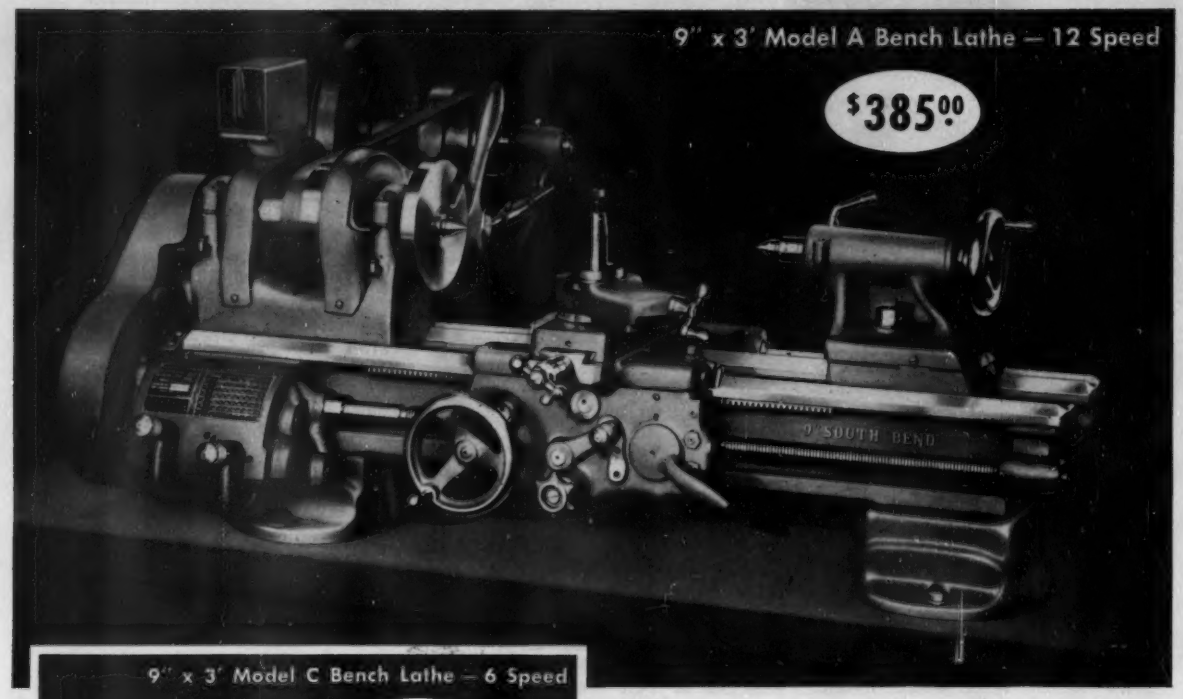
Delpark Filtering Unit For Small Solids

Settling and filtering unit designed primarily for filtration of relatively small solids permits continuous removal of chips, heavy solids, and relatively fine solids to 0.004-in. screening. Unit is made for filtration of liquids of varying degrees of viscosity containing solids of different particle sizes and widely differing weights. Size of unit is dependent upon settling rate which is governed by gravity of solids and viscosity of liquids. System makes use of principle of expelling settled solids with chain driven flights which reduces volume of solids to be removed by filter screen. Filter screens are continuously cleaned by brushes which serve as flights.

Special bar screens with accurate slot sizes provide for filtering solids that remain in suspension as liquid flows toward outlet. Especially designed for cleaning while machine is in operation, they are furnished in slot sizes as small as 0.004 in.

Industrial Filtration Co, Dept S-287, Lebanon, Ind

HERE'S MORE FOR YOUR MONEY



NEW CATALOG

Describes 9" to 16-24" Lathes, ½" and 1" collet Turret Lathes, 14" Drill Presses, 7" Bench Shapers and Pedestal Grinders. Ask for Catalog 5406.

South Bend 9" Lathes represent far greater value than their moderate prices indicate. They are exceedingly accurate, quickly adaptable to a wide variety of work and built to give long, dependable service. These quality features can be offered because of the production economies resulting from volume manufacturing.

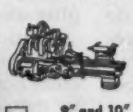
We sincerely believe that they represent more actual dollar-for-dollar value than any other lathe made. Evidence of this lies in the fact that they have out-sold all others. You'll be surprised at the many places these lathes can be efficiently worked into your production plans. Now is the time to have our distributor give you complete information.

(Prices shown are f.o.b. factory, less electrical equipment.)

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941

Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

PLEASE SEND INFORMATION CHECKED:



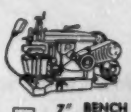
☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES

☐ ½" & 1" Collet TURRET LATHES

☐ TOOL GRINDERS

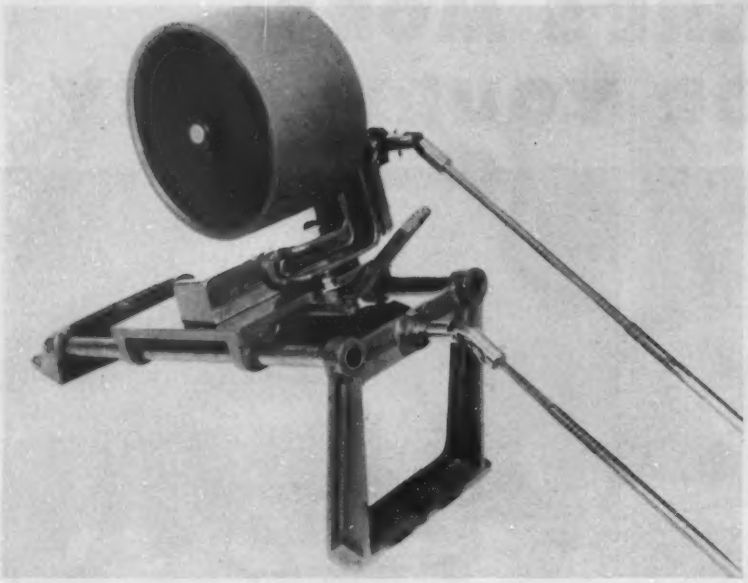


☐ 7" BENCH SHAPERS

Name_____ Street_____

City_____ State_____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana



Fenlind Backstand Idler Offers Remote Control

Heavy-duty backstand idler with 6 in. plastic wheel has two remote control arms. Width of idler wheel permits belt-width range of ¼ to 6 in. Use of plastic prevents marring of surface.

Two control arms which extend from idler to within reach of operator at grinding lathe are incorporated. With one of the arms operator can tilt idler wheel from one side to the other. This lateral movement allows adjustment of belt track without disturbing distance of wheel centers. With second control arm idler wheel assembly can be slid back and forth on its stand to correct belt tension and make up for changes in belt length or contact wheel size without opening blower hood. Range of contact wheels from 3 to 16 in. in dia may be accommodated by this.

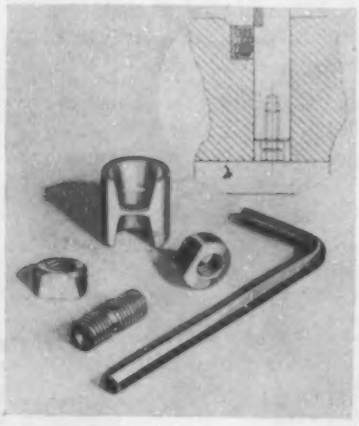
Fenlind Engrg Co, Rockford, Ill

New Carbotronik Instrument For Controlled Atmosphere

Carbotronik instrument provides accurate and continuous method of automatically controlling carbon potential of endothermic furnace atmospheres. Unit assures uniform heat treating results by eliminating constant supervision when adding carburizing gas. It indicates, records, and controls furnace atmosphere carbon potential according to setting selected on instrument panel—handles wide variety ranging from 0.20 to 1.25% carbon. With endothermic atmospheres the carburizing potential is a function of furnace dew point and temperature. Unit couples dew point control instrument with furnace temperature control, automatically correcting for temperature variables.

Dewpoint controller, when used in this system, is graduated in terms of carburizing potential on a logarithmic scale from 0.10 to 1.25 carbon, rather than as dewpoint temperature. Control of carburizing temperature is achieved by using instrument to throttle flow of raw natural gas being added to the atmosphere.

Ipsen Industries, Inc, Rockford, Ill



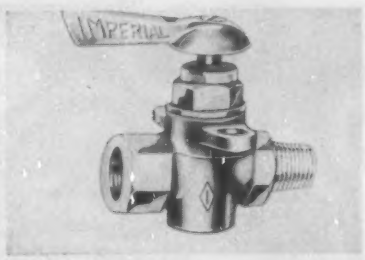
New Cutter Series Uses Dual-Wedg Lock

Dual-Wedg lock introduced by Wesson Co makes possible an improved stagger-tooth and half-side milling cutter series, recommended for general-purpose straddle, face, gang, milling, and slotting operations. Cutter consists of hardened steel body, broached blade slots, and replaceable blades. Both blades, tipped with Wessonmetal carbides, and cutter body are serrated. The 60° by 1/32 pitch serrations make finer positive adjustment possible. Cutter locks slip easily into cylindrical recess in body and two wedges are locked on face of blade by several turns of lock lead screw. Lock seats itself actually and radially even if blade being locked has a step, is out of square or slightly tapered.

Longer cutter body life is said to be assured with self-contained Dual-Wedg lock since moving members do not wear on tool body recess. Wedges lock on face of blade which eliminates need to regularly enlarge sizes of lock recess.

Stagger-tooth and half-side milling cutters are available in diameters of 5, 6, 8, 10 and 12 in.—standard widths of both series are 5/8, 3/4, 1, 1 1/4, and 1/2 in.

Wesson Co, 1220 Woodward Heights Blvd, Detroit, Ferndale 20, Mich



Plug Valve

Plug valve for pneumatic applications, fluid transmission systems, instrumentation and similar uses features pressure-balanced plug and is recommended for working pressures to 300 psi. Convenient brackets are provided for mounting. Internal construction includes pressure passage which eliminates constant line pressure on top of plug. Floating stem promotes perfect alignment of plug and body.

Stem is sealed against leakage by an O-ring. Retaining shoulder on stem makes it impossible for stem to be lifted. Plug is made of special nickel silver alloy and double-ground to prevent leakage or seizure.

Additional information is contained in manufacturer's bulletin No. 3024.

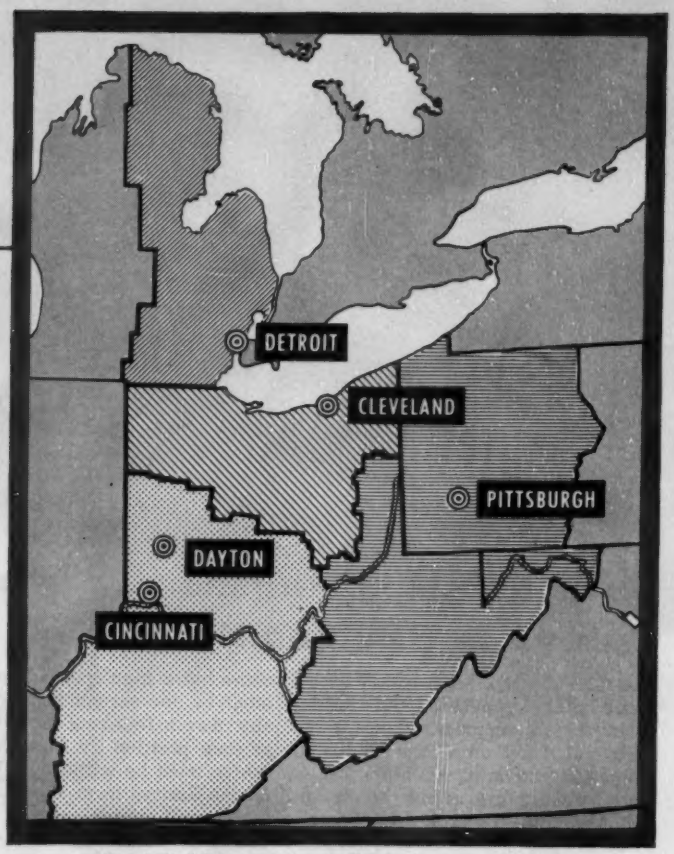
The Imperial Brass Mfg Co, 1200 W Harrison St, Chicago 7, Ill

Fifty Years
1904 • 1954

MOTCH & MERRYWEATHER—

an organization which has served the metal-working industry since 1904.

FIFTY YEARS ago in September, this company was founded as a distributor of machine tools in Ohio and eastern Michigan. Now in the second generation, its operations have broadened to provide a complete machine tool and cutting tool service:



Motch & Merryweather's five offices are located in the heart of industrial America.

- AS *DISTRIBUTORS* OF MACHINE TOOLS AND CUTTING TOOLS:
  Machine Tool Distributor Division
  Cutting Tool Distributor Division
  } *in area shown on map.*
- AS *MANUFACTURERS* OF MACHINE TOOLS AND CUTTING TOOLS:
  Machinery Manufacturing Division
  Cutting Tool Manufacturing Division
  } *represented nationally by distributors.*
- AS *REBUILDERS* OF MACHINE TOOLS:
  Used Machinery and Rebuilding Division — *also nation-wide.*

The last fifty years have seen phenomenal progress in America and throughout the world. In those advances the machine tool industry has played a foremost role. Whatever contribution Motch & Merryweather has been privileged to make can only be an incentive toward continued effort in the same direction during the half century ahead. . . May we serve you?

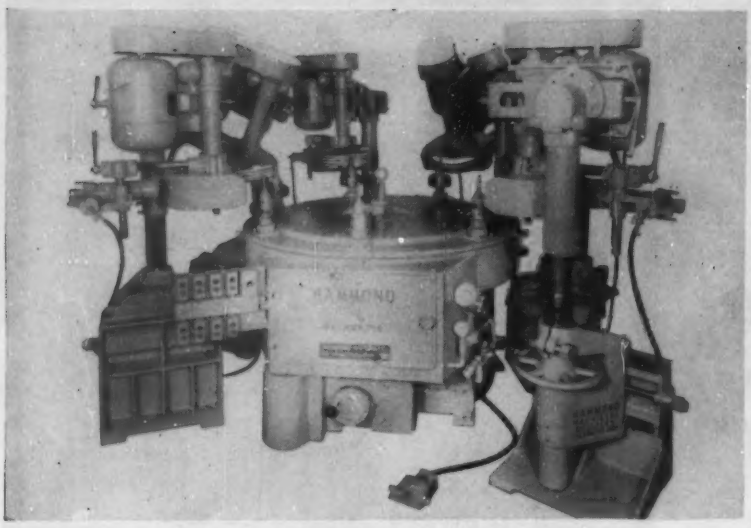
MOTCH AND MERRYWEATHER MACHINERY CO
CLEVELAND DETROIT
CINCINNATI PITTSBURGH

OUR NAME PLATE—
symbol of quality for 50 years.

THE MOTCH & MERRYWEATHER MACHINERY CO.

Main Offices and Plants, Cleveland, Ohio

DETROIT • PITTSBURGH • CINCINNATI • DAYTON

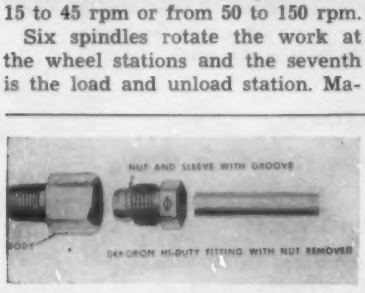


Turret Polishing Machine Uses Up to 6 Buffing Heads

Model K-62-7 is a larger rotary automatic indexing polishing and buffing machine, accommodating up to 6 head and stand units. Turret has a 62-in. OD and is 42 in. high. Table work spindles are driven by ¾-hp motor and have variable speeds from 15 to 45 rpm or from 50 to 150 rpm.

Six spindles rotate the work at the wheel stations and the seventh is the load and unload station. Machine has a high-speed index movement of one second and an adjustable dwell. Indexing table is locked at each position by taper-lock bolt, which must be withdrawn by a cam on the Geneva lever shaft before the table will index again. Machine equipped with six head and stand units weighs 7500 lb.

Hammond Machinery Builders, Inc, 1600 Douglas Ave, Kalamazoo, Mich



Tube Fittings

Line of leakproof tube fittings is said to withstand severe vibration and major tube movement. Of two-piece construction, units are said to effect substantial savings in installation time. Fitting is delivered assembled with nut in body and tube is merely inserted into fitting body and nut tightened—this shears sleeve from end of nut and sleeve then attaches tightly to tube.

Other advantages claimed are that Dekoron Hi-Duty tube fittings withstand over five times as much vibration as compression or flared tube fittings, can be disconnected and reconnected many times without leakage and have long dry-seal type threads. Most sizes are furnished in brass, aluminum, steel and 316.

Dekoron Products Div, Samuel Moore & Co, Mantua, Ohio

Zinc and Tin Gage

AccuRay gage was designed for production line measurement of amount of tin and zinc plated on steel, either electrolytically or by hot dip process. Model RBM is a non-contacting, beta-reflection gage which handles tin plating in the range of ¼ lb per bb to 1 lb per bb and electrolytic zinc from 0.1 to 3 oz per square foot.

Basic components are a source of radiation, a radiation detector, and recording console. Working principle is based on fact that a certain percentage of high speed electrons emitted from a source above base material will reflect back into detector unit. When coating is applied to base material, amount of reflected radiation will change. Variations entering a detector are measured and expressed on the recorder in terms of pounds per base box or ounces per square foot.

Source of radiation and radiation-detecting unit are enclosed in cast metal housing which traverses width of strip. Designed for heavy use, tubes span sheets up to 160 in. wide.

Industrial Nucleonics Corp, 1205 Chesapeake Ave, Columbus, Ohio

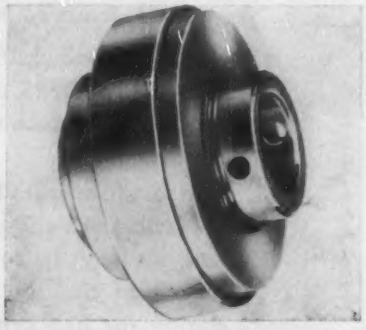
Bernard-Arc Process of Slag-Gas Shielded Welding

Bernard-Arc is a manually applied, semi-automatic welding process which deposits electrode metal at a rate of 10 to 40 lb per hour. The electrode is tubular in construction and a flux is contained within the cavity of the tube. As metal part of the electrode is melted and transferred through arc to become part of weld metal, flux core also melts and is transferred to become the refining and shielding blanket of slag. Both transfer through arc in a finely divided ionized state. While in this finely divided form, a flux as well as metallic electrode would become highly oxidized unless shielded. It is to prevent oxidation, that a separate gas, not a product of the flux, is used for shielding the arc column.

The equipment is new in design and operating principle. Welding current, arc-column shielding gas, water which keeps torch cool, and welding electrode, all pass through handle of torch. Coiled electrode is not located remotely from welding torch—both reel for holding coiled electrode and feeding mechanism are rigidly attached to handle of arc welding torch.

With the exception of guiding the torch along the seam being welded, and controlling the rate at which the torch is moved along the seam for producing the desired size of weld, the welding operation is entirely automatic.

Bernard Welding Equipment Co, 10232 South Avenue N, Chicago 17, Ill



MINIATURE CLUTCH series for overrunning, backstopping, and indexing includes four models with all features of full complement sprag principle. Manufacturer states the clutches have been standardized to meet industry's demand for small size clutches of high torque capacity, low price, long life, and minimum maintenance. Standard bore sizes are ¼, ⅜ and ½ in— *The Formsprag Co, 2361 Hoover Rd, Van Dyke, Mich*

Webber "LABORATORY MASTER" Gage Blocks

Set a New Standard of Accuracy in Dimensional Control

Webber "Laboratory Master" Gage Blocks are the nearest approach to absolute dimensional perfection ever attained. They enable the manufacturer of precision products to enjoy the benefits of incredible accuracy—accuracy which, even a few short months ago, was considered almost impossible to attain.

This remarkable advance in dimensional control, which to all intents and purposes is absolute perfection, is the result of three things:

(1) Human skill and "know-how", which comes only from many years of experience.

(2) Croblox (Chrome Carbide), the material used, has no equal for durability, resistance to corrosion and fine grain structure. The "mirror" finish as imparted by Webber to the Croblox gaging surfaces will not accept oxidation, corrosion or even a microscopic film, any of which would impair the fantastic accuracy of the gages. Surface finish is so smooth that it can be checked only by the Interference Microscope.

(3) The final checking of each gage block in the Webber Laboratory employs the new Zeiss Opton Interferometer ("interference" method), the most accurate system known to modern science.

Webber "Laboratory Master" Gage Blocks Are Essential Equipment for the following:

Ball and Roller Bearing Mfrs. . . . Gage Block Mfrs. . . . Plug, Thread and Ring Gage Mfrs. . . . Precision Instrument Makers . . . Mechane Electronic Devices . . . Elementary Standard for Physical Laboratories.

Technical Information

Parallelism—across width	.000001"
—along length	.000001"
Flatness—across width	.000001"
—along length	.000002"
Deviation from marked size	±.000002"
Calibration by Interferometry	±.0000002"
Accuracy of Calibration	±.0000008"
Coefficient of expansion, per 1° F. per inch	4×10^{-6}

Surface Finish . . . by optical comparison, equal to a quartz flat.
Corrosion resistance—approx. 10 times that of 18-8 Stainless Steel
Material—Chrome Carbide

The Webber Laboratory is maintained at a constant temperature of 68 degrees F. 365 days in the year. The "Laboratory Master" Gage Blocks are intended to be used where constant temperature is maintained. Under such conditions they may be accepted as the final word in accuracy.

Each set bears its own individual serial number and is accompanied by a notarized affidavit certifying the accuracy of the 82 blocks comprising the set. The readings are guaranteed accurate within plus or minus one millionth of an inch.

Due to the extreme care and precision required during the intricate production processes together with the many phases of checking and rechecking during final calibration, from sixty to ninety days are required for delivery.

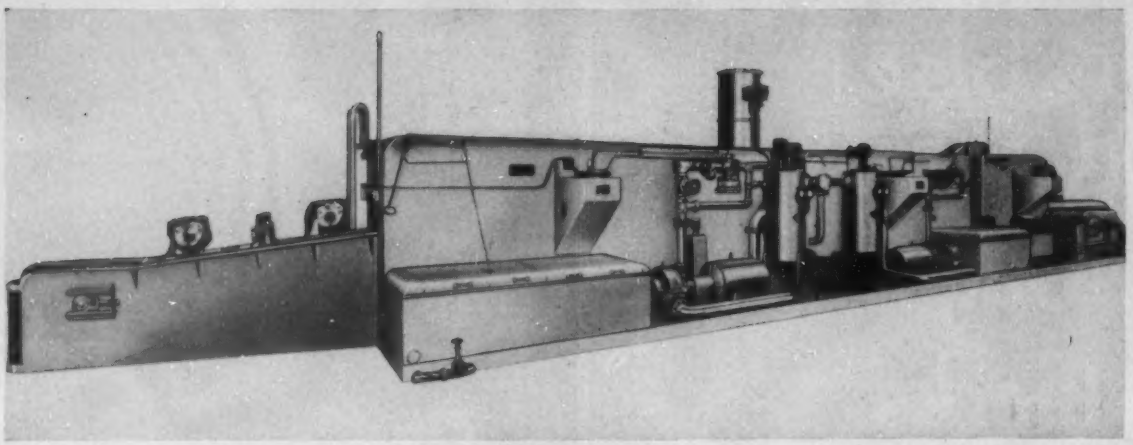
Price $1850.00

Webber GAGE COMPANY

12901 Triskett Road • Cleveland 11, Ohio

Webber MICRO-ACCURATE Gages

Largest Exclusive Manufacturers of Precision Gage Blocks



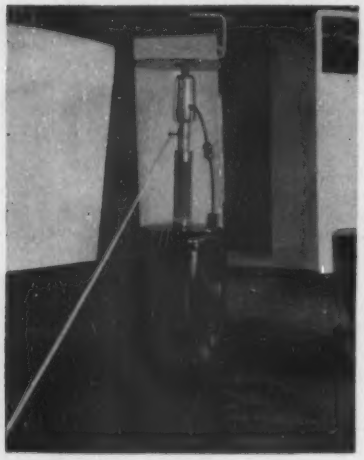
Pin-Point Precision Washer Flushes Holes, Internal Cavities

Automatic indexing, three-stage precision industrial washer can handle 400 automatic-transmission castings per hour. Pin-point action is achieved by locating high-pressure nozzles precisely so they will clean and flush passages and holes.

Unit has hydraulic-powered transfer mechanism electrically sequenced that advances brass fixture pads with parts on them into exact position and locks them there. Passages are flushed from two directions by nozzles, and swing fixtures make spray envelope work for complete cleaning. Shop air is utilized for blowoff controlled by pneumatic timer. Unit will shut off if the part is not removed after the proper time.

High-pressure pumps, Cuno automatic filters, and magnetic separators are provided to keep the cleaning solution clear. Machine has rugged construction and many safety features.

International Conveyor & Washer Corp, 652 E Fort St, Detroit, 26



Reciprocating Disk Atomizer For Ransburg Spray Painting

A reciprocating disk atomizer was designed for use with Ransburg No. 2 process of electrostatic spray painting. Now with up and down motion, unit provides uniformity in painting, not only of small parts, but larger products.

Parts are hung on conveyor which makes circular loop in spray area. Disk atomizer is located in pit on floor in center of the loop. Paint is pumped to center of disk which rotates to feed paint to atomizing edge. High dc voltage, (90 kv) is imposed on disk, establishing electrostatic field between disk and parts hanging on the grounded conveyor. This atomizes paint into fine spray and electrostatically attracts it to surrounding parts. As with all Ransburg process units, no compressed air or water-washed booth is required.

The atomizer does not require precise positioning of parts in relationship to atomizer. Tests show reciprocating unit will tolerate 10 to 24-in. difference with practically no spray pattern problem. Single 25-inch disk is capable of atomizing five times as much paint as one atomizing bell of a Ransburg triple head unit.

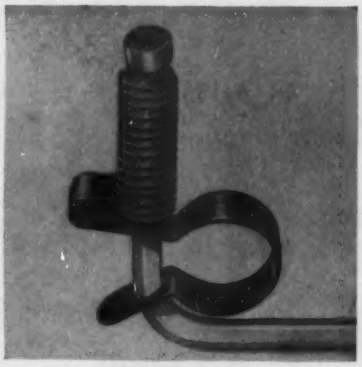
Different reciprocating speeds may be automatically controlled within stroke.

Ransburg Electric-Coating Corp, Indianapolis, Ind

Magnetic Holders And Sockets

Series of magnetic-bit holders and sockets was designed to eliminate lost time and motion on screwdriving operations. Permanent magnet in holders and sockets hold screw or nut firmly in position. Bit holders have bit retaining ring which holds bit in place. They are available for use with all popular makes of spiral and power drivers and also offered in hand driver models.

Apex Machine and Tool Co, 1026 S Patterson Blvd, Dayton 2, Ohio



Hex Key Clipped in Socket-Head Setscrew

Key Klip is a tooling accessory which solves the problem of keeping hex keys firmly attached to socket-head setscrews. Developed primarily for the Vlier screw-ball clamp, the Key Klip engages two or three threads on the screw and employs spring tension to hold the key and set screw together. When set screws or clamps are used on jigs and fixtures, hex key is ready for use. Clip can be quickly mounted or removed from hex key by compressing open spring ends.

Unit is made from clock spring quality steel and is available in three sizes, ¼, 5/16, and ⅜ inches.

Vlier Engineering Inc, 4552 Beverly Blvd, Los Angeles 4, Calif

THIS SLUDGE DIDN'T RUIN AN AIR CYLINDER

proved protection of air equipment with *Norgren* filters

Here's a typical example of why it is essential to filter the air that powers your tools, cylinders, and other pneumatic equipment—if you want best equipment performance and low maintenance costs.

Norgren Filters give you this vital protection. Performance data prove their high efficiency in water removal . . . and, at 80 psi line pressure and flow of 100 cfm, pressure drop across filter is only ½ psi.

WRITE FOR NEW CATALOG No. 600

C. A. *Norgren*® CO.

3436 So. Elati, Englewood, Colo.

PIONEER AND LEADER IN OIL-FOG LUBRICATION FOR 26 YEARS

• VALVES • FILTERS • REGULATORS
• LUBRICATORS • HOSE ASSEMBLIES

Slitting Line Has Nominal Production Speed of 158 FPM

Modern slitting line will handle material of 48-in. width with diameter of cutting arbors of 7 in. Coil capacity is 600 lb by 48 in. wide.

Uncoiler drum, four-segment type, is expanded and contracted by nonrotating hydraulic cylinder. Loop size is controlled automatically within certain limits. When slitting line is stopped, uncoiler drum is automatically slowed and stopped by hydraulic braking action.

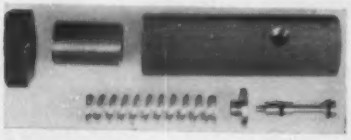
Slitter arbors are driven through universal joints from gearbox connected to motor mounted on slitter base. Overrunning clutches are mounted on each slitter arbor as well as drive shafts of feed pinch rolls and pull out rolls. For convenience in changing slitter cutter and spacer setups, entire pull-out pinch roll and scrap-chopper assembly is pivot mounted. Scrap chopper consists of rotating cutter head equipped for sectional cutting blades extending full length of head and stationary mounted sectional blade. Cutting blades consist of short interchangeable sections.

For coiled stock a side guide is furnished consisting of two banks of vertical rollers with each bank individually adjustable from front of machine. For sheet stock flat table with adjustable side guide is furnished. Table can be lowered out of way or removed when running coil stock.

Recoiler drum can be furnished either as manually or hydraulically-operated expanding type. It is driven by means of slow-speed chain drive from slitter motor through adjustable airflex clutch. When slitting line is being operated as pull-through, slitting line air clutch can be adjusted to act as drive coupling. Stock speed in this type of slitting will be sufficient to pull slitting arbors into over-running speed. If necessary clutch may be disengaged completely leaving drum free to revolve.

In connection with the recoiler a coil stripper is provided consisting of heavy pusher plate supported on large diameter rods and used to strip slit coils of stock off the recoiler drum. Stripper may be actuated by air or hydraulic cylinder. Slitting line recoiler can also be furnished as independent unit having gear-reducer drive coupled to motor mounted on recoiler base.

Kane & Roach, Inc, Syracuse, NY



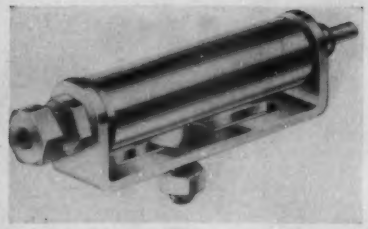
GAGE CUTOUTS are engineered to give low cost protection against excessive line pressures that damage expensive gages, metals and instruments. Sensitive response is afforded at pressures as low as 10 psi. Body is corrosive resistant, lightweight aluminum. Unit is available in two models — low pressure cutout with ranges from 10 to 300 psi, high pressure with ranges from 100 to 3000 — ***Greer Hydraulics, Inc., 454 18th St., Brooklyn 15, N. Y.***

Plate Bending Rolls

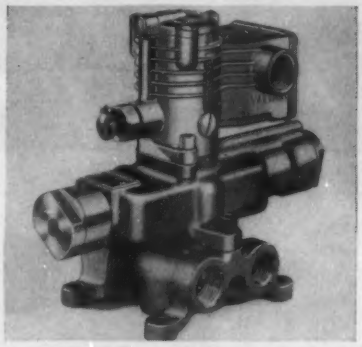
Pope Machine Co. purchased by Kling Bros announces a complete line of rolls for every purpose. Rolls are all-steel construction and include both pyramid and initial pinch types, used in industrial plants for rolling steel, aluminum, and other non-ferrous plate. They are built for continuous production.

No. 3 initial pinch type roll makes possible rolling speeds up to 30 fpm. Features include solenoid brake, heavy structural frame with cast steel housings and all cut steel gears in drive. There is special provision for rolling small diameters.

Pope Machine Co, Inc, 5201 S First St, Seattle, Wash



AIR CYLINDER features new adjustable air clamp. Air cylinder is reported to have proven well-adapted where air-operated ejectors are required. Adjustments are easily and quickly made. Cylinder construction is of heavy wall brass tubing. The 5/16-in.-dia shaft has rapid spring return; mounting bracket is of 3/16-in. steel; entire assembly has smooth finish and is nickel plated. Standard cylinder has 1-in. bore and 2½-in. stroke. Mounting bracket provides 3-in. longitudinal, 360° radial adjustment. Cartridge type cylinder is easily replaced without removing bracket from mounted position — ***Summit Tool & Mfg Co, 2907 Summit St, Toledo 11, Ohio.***



Solenoid Pilot-Operated Air Control Valve

Valvair has expanded its line of Speed King Valves to include units to meet standards set by JIC. All parts are totally enclosed—junction box for electrical control is cast integral with housing of pilot control unit.

Pilot can be mounted in two directions over the base and is universal to all assemblies. All parts are non-corrosive—base is cast bronze, pilot valve a zinc base alloy casting.

Stem in the base and plunger in the solenoid are only moving parts. Pressure range is from 35 to 200 psi for air and low pressure hydraulics. Models for pipe sizes from 1/4 through 1 in. are offered with 2-, 3-, 4-way operation as well as 4-way-5-port unit. Foot or manifold mounting is optional in all sizes except the latter.

Valvair Corp, Akron 11, Ohio

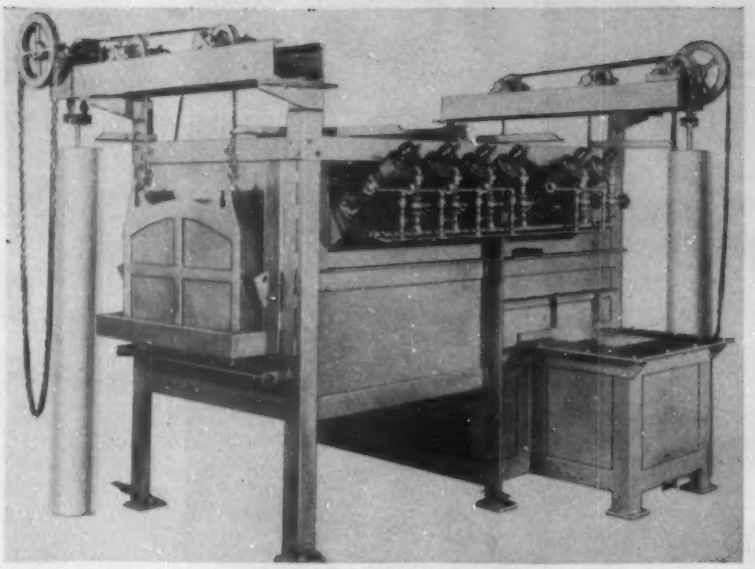
Mattison Grinder beats old time (15 hours) by 12 hours

The picture above shows a punch and die grinding operation on a Mattison High-Powered Precision Surface Grinder at Lyon Metal Products, Incorporated. Previous time on a converted planer-grinder was 15 hours — now with a Mattison Grinder equipped with special fixture, grinding time has been reduced to 3 hours.

Mattison Grinders are proving profitable investments in plants where "time out" for reconditioning is a vital factor in meeting production schedules. Surfaces are reconditioned and edges sharpened in a minimum of time, eliminating costly delays and holdup of production. Many manufacturers installing the Mattison Grinder for reconditioning dies find many other uses for it in grinding flat surfaces where accuracy and fine finish are required. For complete information on the Mattison High-Powered Precision Surface Grinder, send for free copy of our latest circular.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

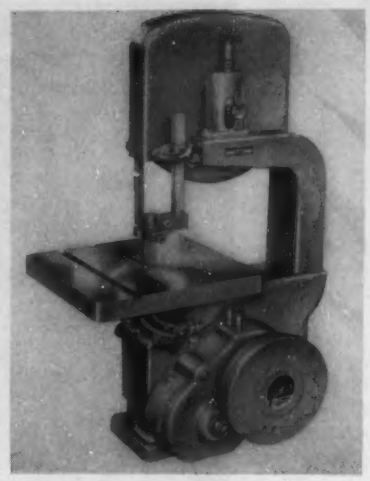


Aluminum Furnace Combines Melting and Holding Baths

Double-chamber dry-hearth melting furnace heats aluminum for die-casting or permanent molding. Use of floor space is claimed 50% higher than with crucible furnaces, and fuel consumption is said to be 40% lower. Design of hearth in melting area that lets metal flow into holding area is said to eliminate metal gasing to improve casting quality.

Units built for gas, oil, or combination firing are available in 12 standard sizes up to 2000-lb-per-hr capacity.

Eclipse Fuel Engineering Co, 1002 Buchanan St, Rockford, Ill

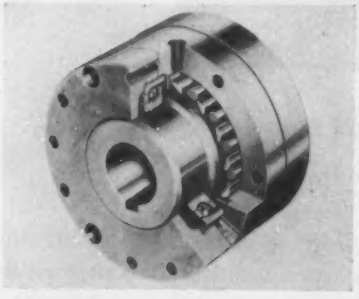


Twelve-Inch Bandsaw Has Two Blade Speeds

Table is 14x14 in., saw has 12-in. throat, and will take work 6¼ in. high above table. Machine will cut to the center of a 24-in. circle. Two speeds available are 100 and 250 fpm, attained with recommended ½-hp. motor. Speed reducer is driven by V-belt, and power is transferred through two sets of hardened sprocket wheels and roller chains to the saw. Sprocket wheel shafts turn on sealed ball bearings. Table is supported by widely spaced trunnions.

Blade guides and ball-bearing support wheels may be easily adjusted and speeds are quickly changed. Unit stands 35-9/16 in. high without stand.

Atlas Press Co, N Pitcher St, Kalamazoo, Mich



General Duty Cam Clutches For Machinery Drive Applications

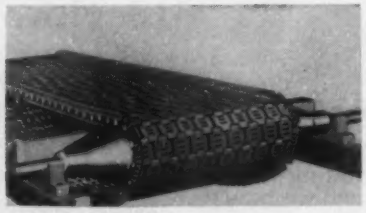
Line of heavy-duty ball bearing overrunning clutches has been added to standard cam clutch line of Morse Chain.

The MC Series includes two ball bearings that maintain concentricity of inner and outer races avoiding need for additional bearings. Typical drive applications of the units, which have alternate low-wedge-angle cam and roller construction, include high speed over-running and back stop applications as well as heavy-duty indexing. They can be used as indexing mechanisms in spring coilers, stock feeds and tire cross-grooving machines. Two-speed drives represent typical over-running applications for these clutches. Tapped holes are provided on both ends for cap screws or studs which can attach sprockets, gears, pulleys or ratchet arms for particular drive requirements from 50 to 545 foot-pounds.

Outer races are hardened and ground; inner races are flame-hardened and ground. End caps are provided with tapped holes for mounting drive components. Tapped holes also serve as puller mountings to remove end caps for maintenance or inspection. No-drag grease retainers hold clutch lubricant in cam space. Two tapped holes for Alemite lubrication fittings are provided opposite each other on outer race.

Clutch cams and rollers are hardened ball bearing steel; rollers are ground and cams are a drawn section. Cam shape is special design and avoids galling of inner race during operation. Cams have a low locking angle to assure self energizing action of each cam.

Morse Chain Co, 7601 Central Ave, Detroit 10, Mich



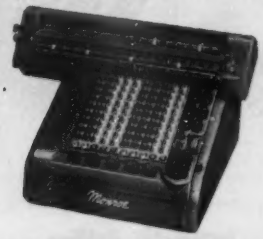
Belt-Conveyor Link Design Improves Heat Circulation

Open link belt is recommended for annealing, normalizing, stress-relieving, and draw furnaces where heat circulation is essential. Belt conveyors are available in widths from 18 to 60 in., are adaptable to comparatively long spans, and will operate in temperatures up to 1800 F. Heavy hinges reduce wear and links are easily replaced.

Standard Alloy Co, Inc, 1679 Collamer Rd, Cleveland 10

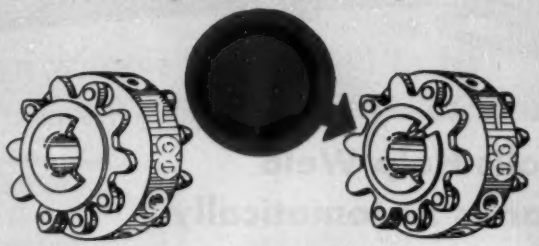
Waldes Truarc rings replace old-fashioned fasteners... save assembly time...end scrap loss...increase operating efficiency

This is the Monroe Calculator



...precision-engineered business machine made even more efficient, and less costly to manufacture through the use of Waldes Truarc Retaining Rings.

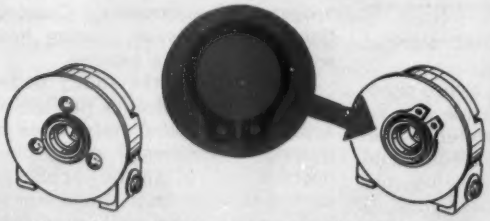
Multiplier Dial Assembly



Old Way. One-piece assembly was spun together. Spinning operation was costly, resulted in high scrap loss.

Truarc Way. Two-piece assembly is held together by one Truarc Ring (series 5108). Rejects: practically zero.

Electric Motor Governor



Old Way. Collector Disc assembly was formerly riveted, requiring skilled labor. Riveted Collector Disc could not be removed in the field.

Truarc Way. Truarc Ring (series 5100) replaces rivets, saves labor, material...improves Collector action. Collector Disc is easily replaced.

Intermediate Gear Shaft

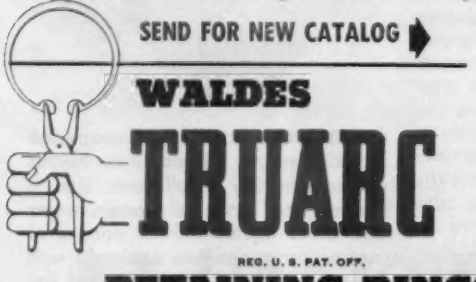
Old Way. Washer riveted on end of assembly for zoning control. Costly, troublesome, hard to obtain critical zoning required.

Truarc Way. Truarc E-Ring (series 5133) cuts assembly time, virtually eliminates rejects and final assembly and zoning problems.

Monroe Calculating Machine Company, Orange, N. J. uses various types and sizes of Waldes Truarc Retaining Rings. Use of Truarc has helped eliminate scrap losses, saved on material and labor, and resulted in increased operating and servicing efficiency of the product. Monroe plans to use Truarc Rings for every possible fastening operation on their entire line!

You, too, can save money with Truarc Rings. Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better, more economical job. Waldes Truarc Rings are precision-engineered...quick and easy to assemble and disassemble.

Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc Engineers for individual attention, without obligation.



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WALDES

TRUARC

REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,382,947; 2,382,948; 2,410,883; 2,420,921; 2,426,341; 2,439,788; 2,441,846; 2,455,163; 2,483,390; 2,483,389; 2,487,902; 2,487,903; 2,491,390; 2,500,981 AND OTHER PATENTS PENDING

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!

AM096

Waldes Kohinoor, Inc., 47-16 Austel Pl., L. I. C. 1, N.Y.

Please send me the new Waldes Truarc Retaining Ring catalog.

(Please print)

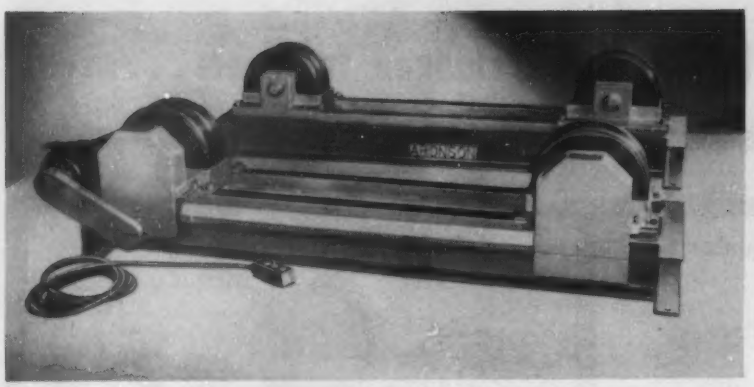
Name .....

Title .....

Company .....

Business Address .....

City ..... *Zone* ..... *State* .....



Rolls Help Weld Tanks Automatically

Cylindrical work with diameters from 8 in. to 16 ft is rotated for welding by a series of rubber-tired turning rolls with capacity from 5000 to 100,000 lb. Turning speeds are 0 to 80 ipm in the 5000 lb class, and 0 to 38 ipm at 100,000 lb.

Six center-distant settings and six drive shafts are provided. Magnetic breaking is standard on units with capacities over 10,000 lb. Steel overload disks beside rubber tires prevent roll crushing.

Aronson Machine Co, Arcade, NY

Power Press Brake For V-Forming

Stub power press brake was developed for V-, U-, and general forming and other requirements necessitating controlled pressure at point of operation. Work cycle is divided into low pressure advance and high pressure forming or shaping period. Timing or cut-in and time period for each phase can be varied. Fully automatic cycling, consisting of low pressure advance, high pressure forming, and controlled retreat is possible.

Length of stroke can be varied from 2 to 11 in. excluding die height. Power unit works off the shop air line with capacity of 42 tons at 100 psi.

Machine operates on hydro-pneumatic booster. Shop airline acts on large-area stepped-diameter piston to boost pressure of hydraulic fluid on small area side. High-pressure oil is channeled to another hydraulic cylinder which does the work.

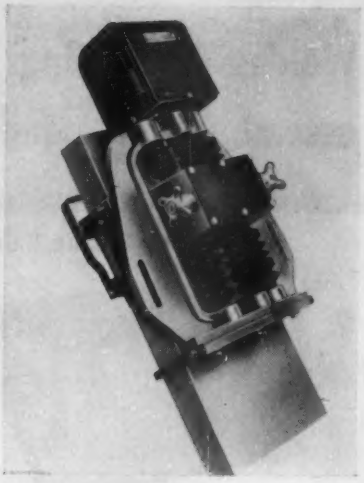
Machine is adaptable to most types of power brake press dies in short lengths up to and including 24 in. It has universal application and can be applied to fabrication of wraparounds with sharp corners or any desired radius, together with any standard brake operations.

Dayton Rogers Mfg Co, 2824 - 13th Ave South, Minneapolis 7, Minn

Automatic Sorting Gage For Bullet Jacket Cups

Automatic sorting gage accomplishes gaging by jets of air which measure wall and base thickness of copper-clad bullet jacket cups in one operation. Cups start path through gage in vibratory feeder, walk up incline and arrange themselves in uniform position before sliding down gravity chute. Pneumatic cylinder operating at 2500 pieces per hour brings cups into gaging position. Dimensions are amplified in ratio of 2700 to 1. System of pneumatic relays receives measurement signal and actuates electrical sorting gates. Actual dimensions of each piece are shown.

Moore Products Co, Philadelphia, Pa



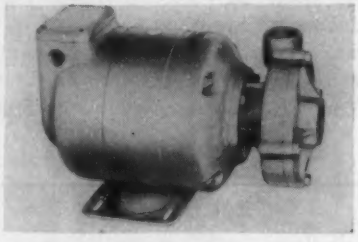
Automatic Buffing Compound Applicator

Air-operated automatic buffing compound applicator accommodates bars to 10 in. wide and 2 in. thick. It can be installed in all types of buffing machines from simple lathes to multi-operation automatics. Construction permits use on floating heads without disturbing balance.

Applicator has the ability to feed any number of strokes per minute, applying compound only when required. In addition it is possible to operate up to eight applicators simultaneously from single controlling valve. With each application compound is fed forward to compensate for wear of bar. Rate of feed is adjustable from 0.0015 to 0.015 ips.

Major parts of the unit are fabricated of cast aluminum. All operating parts are covered. Moving parts are bearing mounted.

George L Nankervis Co, 19255 West Davison, Detroit 23, Mich



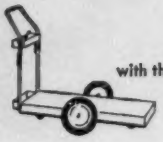
CENTRIFUGAL PUMP, direct-connected motor driven, is adaptable to various air conditioning installations. Unit is bronze fitted and will handle water and other liquids without danger of rust or corrosion. It is equipped with latest type self adjusting seal and furnished with ¼, ½, and ¾-hp motor. No additional mounting bracket is required — *The Ruthman Machinery Co, Cincinnati, Ohio*

Here's how planned, mobile, power lubrication can boost production ...slash costs...up profits!

This "lubrication department on wheels" is tailored to fit the lubrication needs of your plant...exactly!

If in your plant there is a need for all kinds of lubricants all over the lot, then an Alemite Lubrikart is the answer. This single unit is actually an amazing versatile "lubrication department on wheels." With it you can provide hand, air or electric pumps for pressure-gun greases, hand guns and loader pumps, gear oil dispensers or oil can fillers.

In addition, the Lubrikart carries special hand guns, extra parts and tools right to the machines where they are needed, when they are needed. You get all the advantages of power lubrication right on the job. The savings in time is important. But even more important, proper lubrication protection is assured, machines produce longer with less wear and the savings in lubrication downtime more than equals the cost of the equipment!

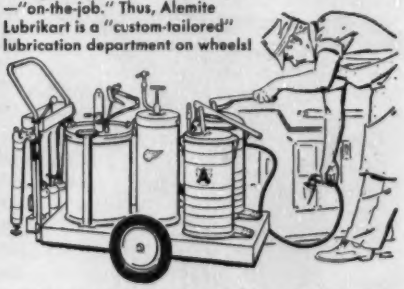


Mobile Power Lubrication begins with this sturdy hand truck, the Lubrikart. Highly maneuverable, it goes anywhere in the plant, navigates a 26" aisle, turns in a 49" circle.

From standard Alemite equipment you choose the *exact* items your plant needs. Air, electric or hand operated pumps handle *any* lubricant needed. And Lubrikart brings necessary equipment right to the machine!

Now, the Lubrikart, filled at the central lubrication room, is ready to service hundreds of bearings requiring a variety of lubricants. Lubricant is completely protected at all times—reaches bearings "refinery clean!"

Operator has a complete selection of equipment plus spare parts, fittings, etc., to do a complete job—"on-the-job." Thus, Alemite Lubrikart is a "custom-tailored" lubrication department on wheels!



with Alemite Plan "E" lubricant is "Refinery Clean" at all times!

This planned assembly and use of Alemite Lubrikarts is known as Alemite Plan "E." It is one of the five Alemite plans that your trained Alemite representative can show you. Ask him about the colorful, new, informative slide film, "No Margin for Error" which will help you and your men cut production costs. No obligation, of course.

Free!

New Booklet "5 Plans for Better Plant Lubrication"

ALEMITE, Dept. C-94
1850 Diversey Parkway
Chicago 14, Illinois

Please send me my copy of "5 Plans for Better Plant Lubrication"

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Company_____

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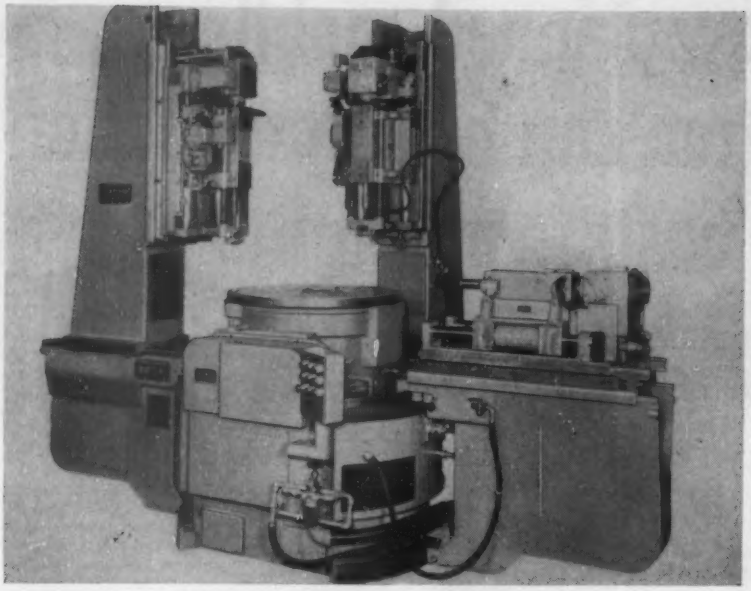
A PRODUCT OF SW STEWART WARNER

Ask Anyone in Industry



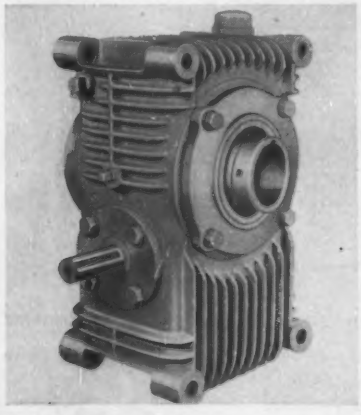
Big Universal Drilling Machine Features Cam Program Control

Air-hydraulic heads on this 17,800-lb machine will drill up to ¾-in. holes in mild steel and ½-in. holes in stainless. Up to 192 indexes can be made, and work capacity ranges from 30 in. to 87 in. OD. Bolt circles with diameters of from 8 to 65 in. can be machined.

Up to 4 drilling or tapping units may be adjusted radially, vertically, and circumferentially, and they may be controlled by easily changed cams. Unit was designed to be accurate enough for aircraft parts and rigid enough to hold tolerances on heavy work.

Design is for specialized drilling, but features adaptability for new jobs. Spindle speeds range from 180 to 6700 rpm and feeds from ½ to 40 ipm. Standard indexing plate has 96 notches.

Hartford Special Machinery Co, Hartford 12, Conn



Speed Reducers With Double Enveloping Gearing

Shaft-mounted speed reducers offering operating advantages possible with double-enveloping worm gearing are available from Cone-Drive Gears. Right angle between input and output shafts offers many applications and space saving advantages. Reducer is mounted directly on driven shaft and requires only a simple bracket or torque arm to prevent it from rotating about driven shaft.

Where motorized reducer is desired, bell housing can be furnished to accommodate standard NEMA C-type flanged motors. Units are being manufactured in three sizes: 2, 2½ and 3-in. center distance, and can be furnished in pinion-under, pinion-over or vertical-shaft models. Since double-enveloping worm gear reducers have inherent advantage of providing more horsepower per pound and per cubic inch, space requirements are considerably smaller than conventional reducers of comparable rating.

Reduction ratios for the 2 and 2½-in. center distance reducers are from 5:1 to 50:1; the 3-in. models from 5:1 to 60:1. When motor is connected to imput shaft by means of V-belts and sheaves, additional output speed reduction can be secured. Loads that can be handled range from fractional horsepower to 3, 5½, and 9 hp respectively.

Cone-Drive Gears, Div Michigan Tool Co, 7171 East McNichols Rd, Detroit 12, Mich

Ultrasonic Gage Uses Television Tube

Vidigage measures thickness and detects laminar flaws from one side of the work. Sweep-width adjustment permits infinite choice of thickness scales, making it possible to read directly thicknesses from 0.012 to 2.5 in. with accuracies reported as high as 0.1%.

The vacuum tube oscillator uses a specially designed variable inductor for the frequency sweep. Thickness measurements are projected on 21-in. television tube screen.

A special feature is the plug-in assembly which can be attached to the operator's belt and connected to the cabinet by cable of 100 ft without affecting readings. Coupled with the long-distance readability of the large screen it makes it possible to permit measurements over an almost unlimited area.

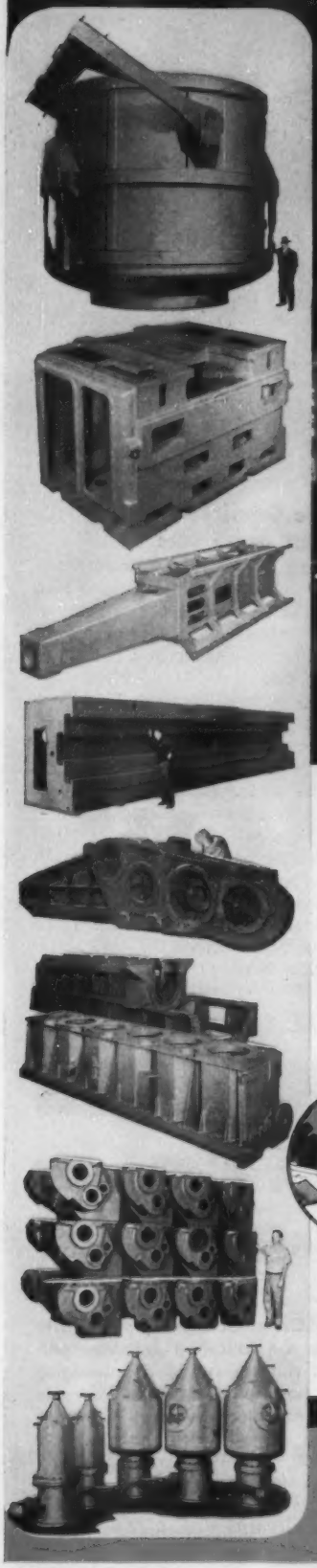
Branson Instruments, Inc, Stamford, Conn

Maintenance Kits for Fast Thread Repairs

Three new thread repair kits have been designed to provide maintenance men with quick permanent solution to tapped thread repair problems. The 34CS kit has inserts and tools in four sizes; wider range kit contains inserts and tools in eleven sizes.

The automotive thread repair kit contains a range of five sizes in either NC or NF series. Because of flexible packaging arrangement within kit, customer may designate thread sizes he finds most useful to him.

Heli-Coil Corp, Danbury, Conn



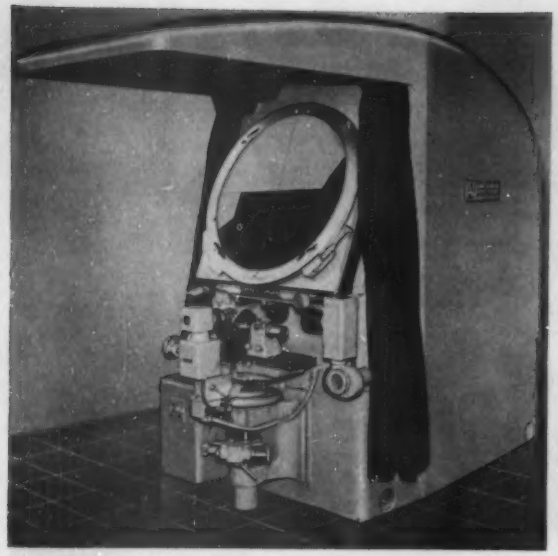
Use WELDED STEEL
for Greater Strength
with Less Weight!

The 86-foot pressure vessel illustrated above is a Stabilizer built for a petroleum refining plant. This unit and its Overhead Receiver were Steel-Weld Fabricated by Mahon in accordance with the A.S.M.E. 1952 Code. Platforms, Ladders, and other miscellaneous iron, to complete this unit in the field, were also produced by Mahon. Equipment of this type, and the products, parts and assemblies shown at the left are typical of thousands of Steel-Weld Fabricated units produced and machined by Mahon for hundreds of processing plants and manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. Perhaps you, too, could profit by discussing this unique service with a Mahon engineer. If you require special equipment, or parts or assemblies including large, heavy pieces, where time and pattern costs are a consideration, Mahon Steel-Weld Fabrication may prove to be the answer. You can turn to Mahon with complete confidence . . . personnel and facilities are available within the Mahon plant to do the entire job from drawing board to finished machining. You will find in the Mahon organization a reliable source with ultramodern fabricating, machining and handling facilities to cope with any type of work regardless of size or weight. See Mahon's Insert in Sweet's Product Design File, or have a Mahon engineer call at your convenience.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON



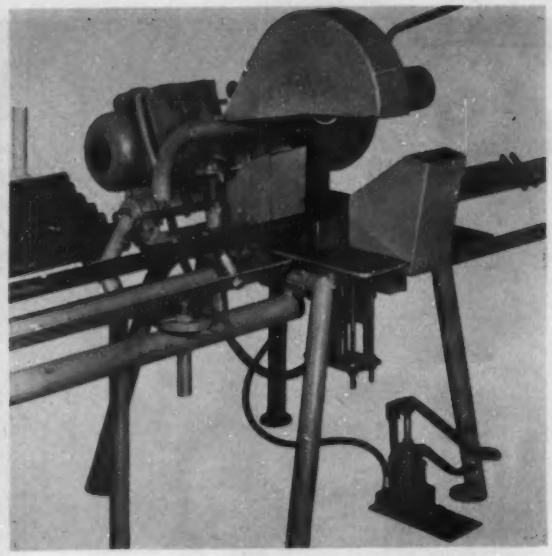
J&L Optical Comparator Is Completely Redesigned

Model FC-30 optical comparator has an integrated design built to precise machine tool standards to allow the operator to easily stage cumbersome parts on the low-level work table to work within inches of the eye-level viewing screen (56⅜ in. from floor to centerline). Electronically controlled, variable-speed power elevation provides quick measurements to 0.0001 in. with finger-tip control. Carbide-tipped micrometers graduated for direct reading in either direction are combined with micrometer zeroing anvil. Quick zeroing vertical measuring dial is graduated for direct reading up or down. All measuring dials are illuminated.

Both 5- and 8-in. capacity are combined in one machine with easy change-over. J&L 6-in.-dia projection lens is applicable to this machine. The hood allows permanent photographic records to be taken direct from viewing screen.

In addition to these features all previous features are included: angle measuring with 1-min vernier; table rotation up to 15° right or left; high-intensity projection lamphouse adjustable for work clearance; colinear reflection attachment for brilliant surface illumination; magnifications changed for shrink tolerances by means of positive mirror locator; precision lenses from 5 to 100 magnifications with 0.300 to 6-in. aperture and 2.375 to 12.5-in. focal clearance; ball-bearing slides on four table styles with lateral measuring ranges from 4 to 8 in., and capacity between centers from 8 to 24 in.

Jones & Lamson, Springfield, Vt

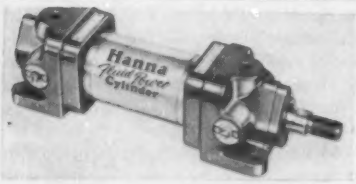


Abrasive Cutoff Saw Cuts Fast and Square

According to the manufacturer, cutoff saw permits fast, square, and practically burr-free cuts of tubular sections up to 4½ in. OD or equivalent relieved shapes and solids up to 3 in. dia.

Abrasive wheel mounted on ball bearing spindle maintains perfect alignment. Powered by 7½-hp motor with interhcangeable V-belt pulleys to drive 16-in. cutting wheel, unit has completely enclosed motor, drive and cutting wheel, balance mounted on shielded ball-bearing pivot unit. Counterbalance allows light hand pressure to draw saw to work. Chip and dust deflector on table plate protects operator.

Wallace Supplies Mfg, Co, Dept AMN, 1200 Diversey Parkway, Chicago 14, Ill



Fluid Power Cylinders

Fluid power cylinders feature large capacity to size ratio. The 750 series has been redesigned to: produce more compact cylinders of large capacity; to incorporate Hanna cushion design; reduce friction to minimum; design all components of consistent strength with no weak links; to conform strictly to JIC standards.

Hanna Engineering Works, 1751 Elston Ave, Chicago 22, Ill

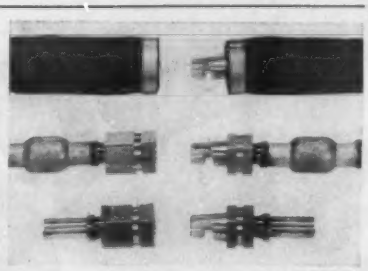
Combination Welder and Stand-by Power Unit

Combination welder and auxiliary or standby power unit, Weldanpower machine, is rated as 200 amp welder or 4 kva continuous duty power unit. For intermittent standby power it is rated at 5 kva.

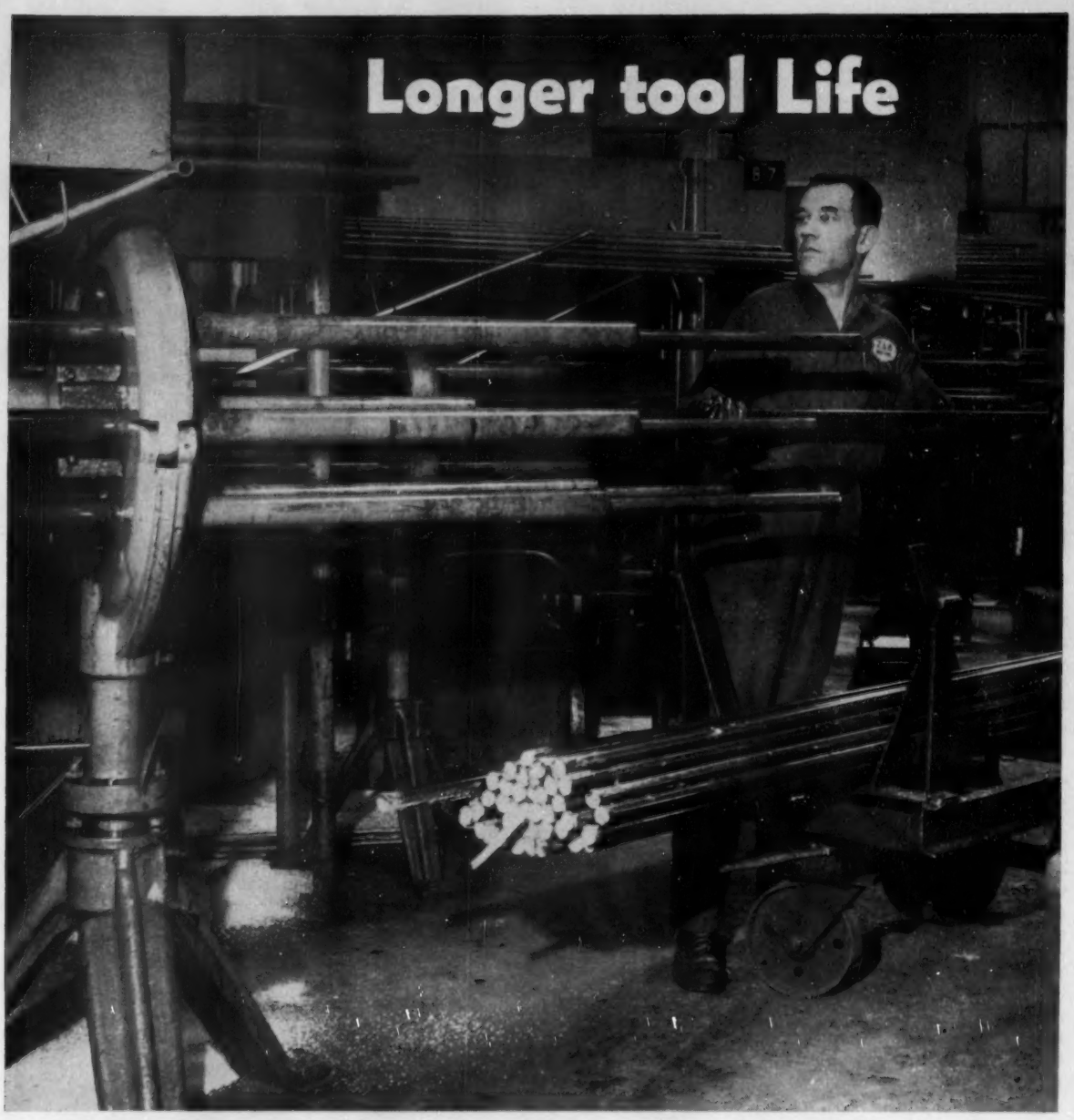
For business and industrial use machine supplies wide range of ac current for maintenance welding. It also supplies 230/115 volt, 60-cycle, single-phase standby power.

For welding operating panel provides taps which supply ac current for use with electrodes ranging from 5/64 to 3/16-in. dia. Continuous current range from 20 to 200 amps is provided for welding, hardfacing, brazing, heating, and soldering.

The Lincoln Electric Co, Cleveland 17, Ohio



TAPER-LOK quick connector is said to provide the following features: permanent connections, positive wedging action, positive locking action, durable rubber insulation; insulation Punch-Lok banding method which prevents cable insulation creeping; female end protection; 500 amp capacity; able to withstand vertical or horizontal pull; and replaceable stud — *Erico Products, Inc, 2070 East 61st Place, Cleveland 3, Ohio*



Youngstown

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COLD FINISHED CARBON AND ALLOY STEEL BARS

●A battery of machines consume tons of screw machine cold finished bar stock. Yet, tool wear is normal when it's Youngstown steel you're using. That's because composition, structure and surface conditioning, combined with "know how" in cold finishing, assure proper, scale-free machining stock. Use Youngstown Cold Finished Carbon and Alloy Steel Bars for longer tool life.

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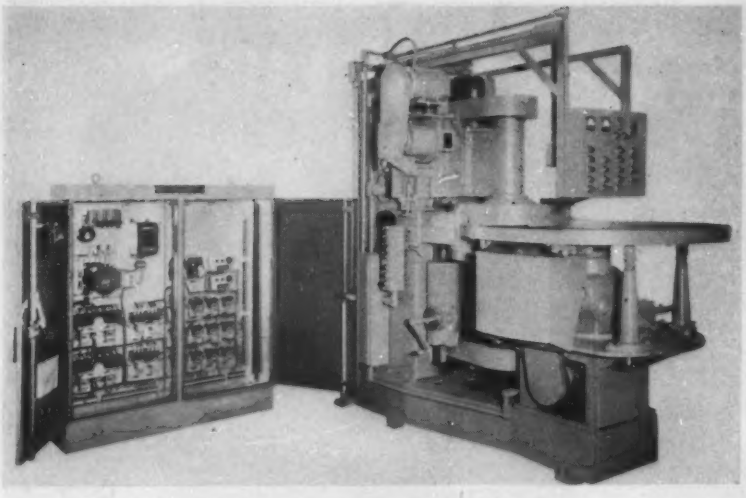


Specialized Spring Grinder Does 1920 Per Hour

Automatic cycling controls spring grinding on No. 929-30/60 vertical-spindle grinder. Characteristic job is automotive shock-absorber springs, varying in wire size from 0.080 in., to 0.105 in., with an ID of 0.586 in. Ends are ground parallel with a 320° cleanup, and must be square with axis of the spring within ½ degree.

Grinding is done dry after springs are loaded into the slowly rotating feed wheel. After spark-out period, grinding wheel rises to upper position and feed wheel decelerates. Springs are unloaded by gravity.

Besly-Welles Corp, Beloit, Wis

Inclinable Punch Presses Feature Extra Capacity

Three new model open-back inclinable punch presses feature extra wide beds, extra deep throats, and large openings through back, large ram faces, and extra shut height. Machines are identified as Models 33, 44, and 55.

Model 33 is a 27-ton capacity unit with standard 2½-in. stroke and up to 6-in. stroke available. Bed size is 32 x 16 in., 21 in. opening through back. Die-space bed to ram face. stroke down and adjustment up, is 12 in. on standard model and up to 17 in. on special order. Throat depth from ram center to frame is 9 in. Face of flange ram is 18 in. wide, 8 in. deep. Flywheel model has 120 spm standard, 53 spm for geared type.

Model 44 has standard stroke of 4 in. with flywheel model rated at 105 spm, back geared model 46 spm. Up to 8 in. is available on special order.

Model 55 (65-ton capacity) has standard 4 in. stroke—flywheel type delivers 100 spm; bullgear type 45 spm. Special order provides 9-in. stroke.

Johnson Machine & Press Corp, 620 W Indiana Ave, Elkhart, Ind

Japanese Optical Comparator

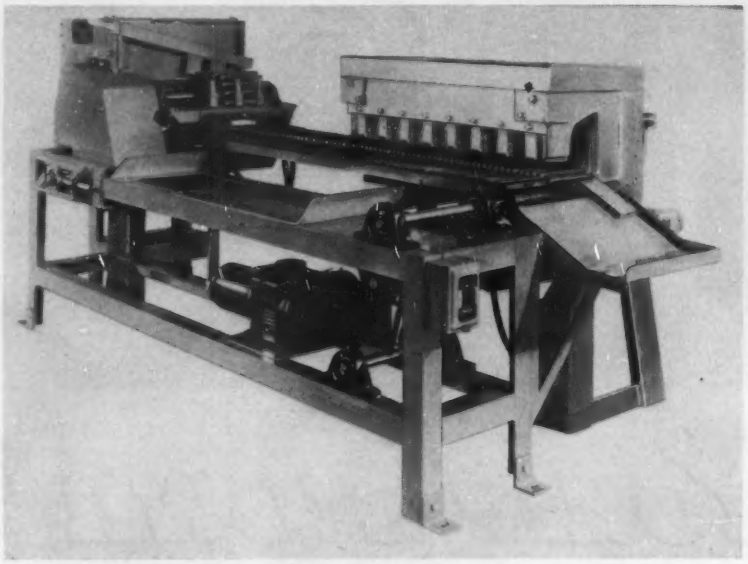
Shadowgraph, produced by Japan's leading optical company, is available in the US for industrial users who require enlarging instrument of extreme accuracy. Unit rests on edge of table and permits number of viewers to observe image thrown on 330-mm screen. Magnification is up to 230 times. Any of three projection lenses can be brought into use by rotating device. Translucent objects are thrown onto screen by penetrating light, while opaque objects are brought to sceren by reflecting light.

Imported by Nikon Inc, New York

Internal Groove Gage Heads

Y series internal groove gage head was designed to check diameters of wide range of O-ring grooves, snap-ring grooves, and short counterbores, making available from stock gage heads usually available only on special order. Series have been engineered to interchange with all standard RIMAT gage heads on standard gage bodies. It will read accurately to 0.0001 in. Groove diameters ranging from ¼ to 5 in. may be checked.

Rimat Tool Co, 21 West Dayton St, Pasadena 2, Calif



Furnace Feeder Heats Bar Ends Automatically

Mechanical hopper feed unit at one end of furnace conveyor supplies bar stock before upsetting operation. Bars are carried through heating zone at speed necessary to satisfy desired heating cycle.

Unit will supply Model 10D fotoflame furnace with ⅝-in. bar stock at 600 pieces per hr.

Equipment improves working conditions, promotes product uniformity and increases production.

Gas Appliance Service, Inc, 1211 Webster Ave, Chicago 14

HY-PRO SPECIALIZES IN PRODUCING TAPS!

...to save you time and money

Yes, we do specialize in tap production. To be exact, it makes up the bulk of our output. And because of this, our engineer specialists —in fact, our entire organization—concentrate their efforts on the design and perfection of one important line—Hy-Pro Taps.

Whatever your tapping needs may be—from a special design problem to advice on your present production setup—these Hy-Pro Engineer specialists are ready to work closely with you.

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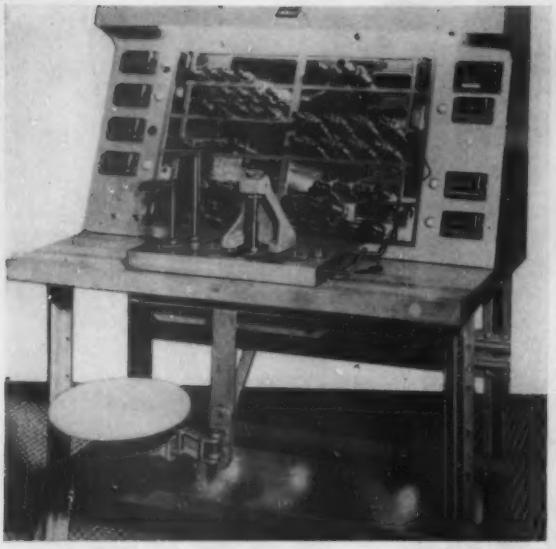
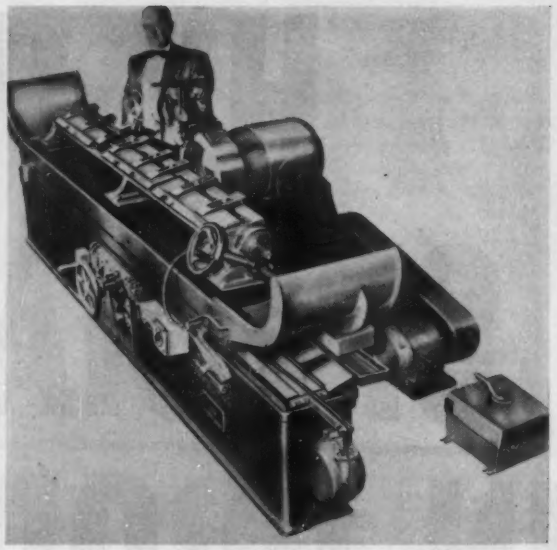




Scully-Jones Special Tool Control Method

Scully-Jones is now producing special tool control panels (Toolitrols) with automatic counting and signaling devices.

Units were designed to coordinate at-the-machine functions of presetting, storing, and changing cutting tools. They are specially built for each machine installation including round-the-table, single-end trunnion, double-end trunnion, and various combinations of way-type machines as well as semi-standard drill heads.

Toolitrol cabinets are constructed of sheet metal and mounted on steel benches with hardwood tops. Each machine station and spindle is represented by at least one corresponding station on a Toolitrol with a name plate identifying tool sizes, station numbers, tool numbers, and adapter sizes.

Tool panels are chrome plated and outlined with metal strips—red to indicate left-hand stations, blue for right-hand. If machine has vertical stations, corresponding tools and gages are then positioned accordingly.

To automatically control tool changes, counters are set for predetermined number of machine cycles and light signals operator. A surface plate with bushings to accommodate each adjustable adapter size is used for adjusting or preseting drills, reamers, taps, and other cutting tools.

Two types of Scully-Jones gages are available for accurately gaging tool projection. Special gages with dial indicators may be furnished for checking of both concentricity and size.

Damage to machine bearings, oil seals, adapters and cutting tools is reduced by presetting and by use of keyhole tool ejector which is shown protruding from surface plate in illustration.

Scully-Jones & Co, 1901 S Rockwell St, Chicago 8, Ill

Chrome Electroplater Coats Tools to 0.0001 in.

Krome-King is a simplified precision plating process for coating chrome on tools and gages. Soft, dull chrome is imparted when coated at room temperatures, and a bright, hard, ductile chrome is imparted when the tank is held at 130 F by an immersion heating unit.

Both power and tank units are made in varying sizes with all units featuring close control of plating thickness by means of a time-dimension method. Plating solution is kept in condition by controlling specific gravity. Cost of plate is said to be less than a half cent per 0.001-in. deposit on 1 sq in. of surface.

National File Co, Lansing, Mich

Rogers Machine Knife Grinders Add Time-Saving Devices

Two time-saving devices are available on the Rogers NY and 220 Series machine knife grinders.

One is an air-clamping device designed to provide instantaneous clamping of knives in grinding position. Knife setup time is reportedly cut to one-tenth the former time required to secure the knife by bolt method. Operator merely aligns knife and presses button.

The second device is an automatic timing service which automatically stops the grinder, including motors after a predetermined grinding period. When the preset time is expired, the grinder continues operation until the end of its stroke to prevent burning or uneven work. Automatic infeed operates in conjunction with timing device and can be set within limits of 0.0005 to 0.005 in. grind per table cycle.

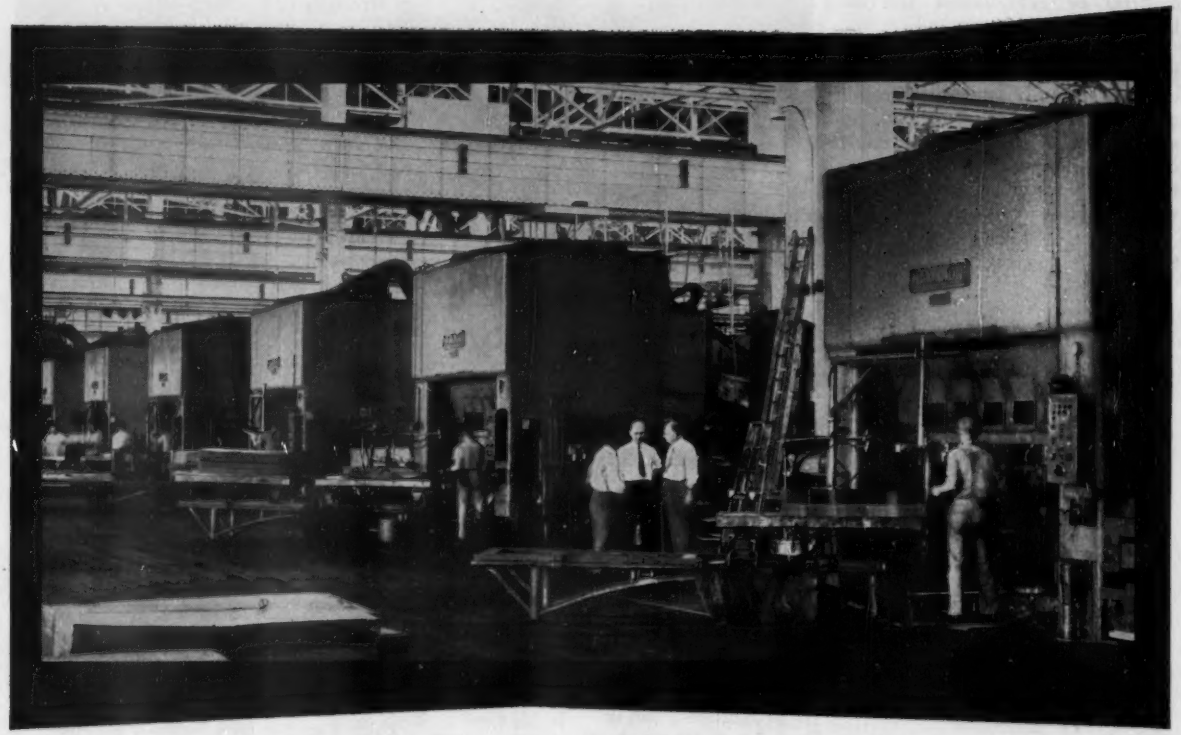
Samuel C Rogers & Co, 191 Dutton Ave, Brooklyn 10, NY

LIGHT-WEIGHT UNIVERSAL JOINT embodies all Rzeppa constant velocity features, stated by the manufacturer to be: compactness, ruggedness, uniform flow of power, minimum weight and long life. Units were designed to satisfy need for miniature joint of this type — *Joint Div, The Gear Grinding Machine Co, 3901 Christopher, Detroit 21, Mich*

HAMILTON

TRIPLE and DOUBLE ACTION PRESSES

head more than three-quarters
of the master production lines in the
largest auto-body stamping plants



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HAMILTON PRESS DIVISION
Curtis Building, Detroit 2, Mich.
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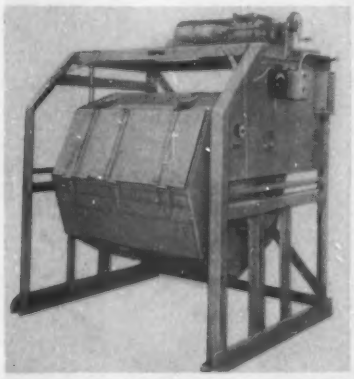
BALDWIN-LIMA-HAMILTON

Electric Industrial Truck Suppresses Radio Interference

Yale & Towne has designed and built an electric truck with effective radio interference suppression. Trucks can now be used near radio or radar installations, in plants where two-way radio is employed, and around industrial or commercial television installations.

Interference in reception was traced to normal sparking in electrical contacts of battery-powered industrial trucks. At government request, Yale developed an electrical circuit utilizing capacitors, which eliminated troublesome sparking of all commutator contacts.

The Yale & Towne Mfg Co, Philadelphia, Pa



Low-Temperature Tumbling Barrel

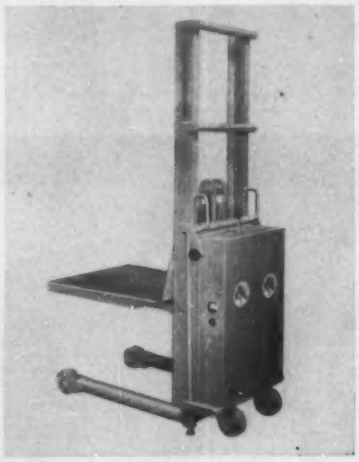
Thermostatically controlled, low-temperature tumbling barrel is designed for deflashing parts molded of soft rubber. Barrel utilizes liquid CO_2 with constant control of temperature. The CO_2 is contained in a separate tank and fed through appropriate controls into barrel where it expands and absorbs heat.

The barrel has an operating temperature range of 0 to - 120 F. Octagonal in shape, it is lined with stainless steel and insulated with 3-in.-thick special material equivalent to 5 or 6 in. of conventional insulation. Both operating and cooling times are reported to be 30 to 50% shorter than normal.

Features include completely guarded chain drive, variable-speed gearhead motor with magnetic brake, hinged door with spring loaded latches and manually operated pushbutton control with thermal overload protection.

Specifications: outside barrel 30-in. dia by 36 in. long; inside barrels 26-in. dia by 33 in. long; floor space 46x48 in.; height 65 in, and weight 1300 lb.

Tumb-L-Matic, Inc, 4510 Bullard Ave, New York 70, NY



Battery Operated Handy Hoister

Lewis-Shepard Products announces a battery-operated handy hoister—lightweight, compact electro-hydraulic stacker of 1000-lb capacity available in two models, platform and straddle. Platform type has carrying platform 3 in. long by 24 in. wide. Straddle model has forks either 30 or 36 in. long and can handle pallets up to 48 in. long. Lifting height of both models is 58 in. and weight approximately 500 lb.

Lewis-Shepard lift cylinder pump and valves are used to give lift speed of 25 fpm with 1000 lb loads. Electro-hydraulic power is furnished by storage battery with built-in charger. Lifting and lowering of load is accomplished by single control lever.

Lightweight power-lift is said to be ideal for applications where usage is frequent, a fast lifting speed is necessary but the use of an expensive power truck is not warranted.

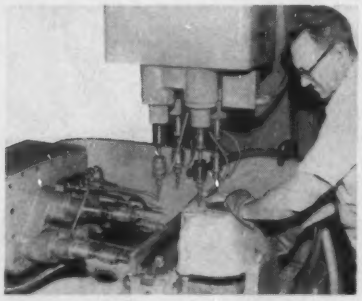
Lewis-Shepard Products, Inc, Dept R-43, Watertown, Mass

Stocktainers

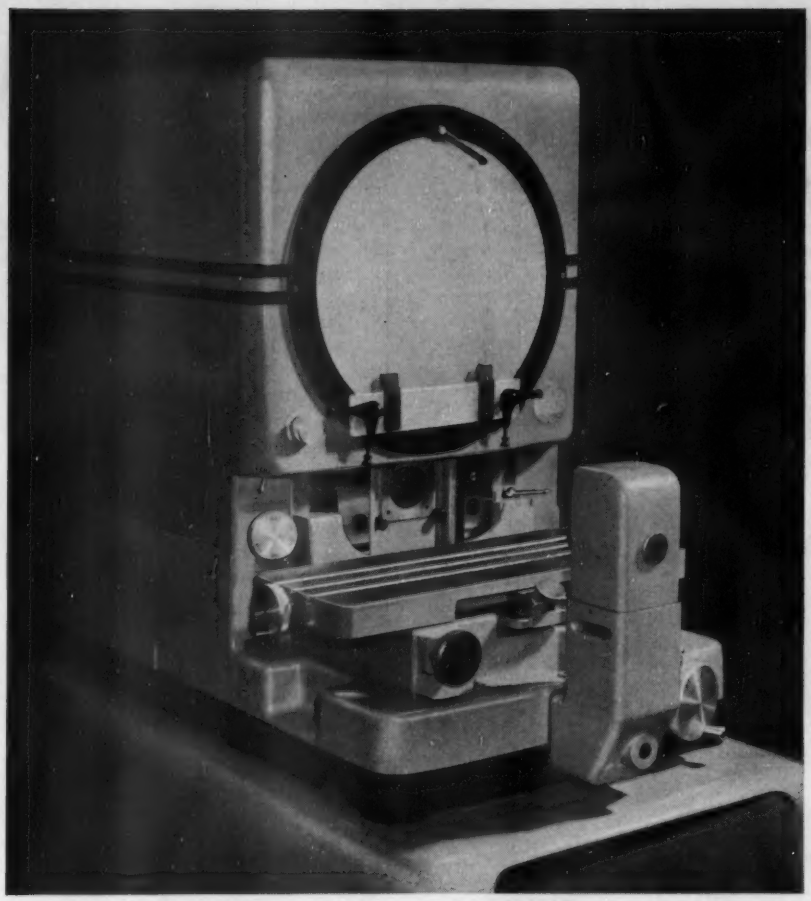
New line of Stocktainers features drop sides on either side of unit to allow freer access during storage and production operations. Unit is made with heavy-duty cast malleable legs and built-up mounts which provide greater strength and allow safe stacking when material protrudes above unit top. Additional strength and accessibilty is added by use of clear-view gridiron channel base.

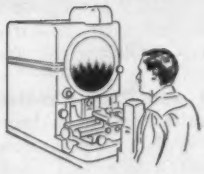
New locking device holds Stocktainer sides without danger of accidental release. Units are made in one, two, and three-ton capacities and fold to one-quarter of the open size.

Rack Engineering Co, Connellsville, Penna



SPECIAL MACHINE was designed for tapping four 5/16-18 and four 7/16-14 class 2 holes in diecast aluminum transmission cases. Two-way tapping machine is equipped with new type of adjustable torque releasing driver which is said to have virtually eliminated tap breakage. A spring-loaded centering plug absorbs shocks when bottoming in blind holes. The cushioning stop and instantaneous release of the driver permits bottom-tapping at full speed to full depth. Also the over-running roller drive releases completely when torque approaches strength limits of tap. In releasing, the outside member of driver revolves around inner drive collet member on anti-friction ball bearings — *Scully-Jones and Co, 1901 South Rockwell St, Chicago 8, Ill*





For maximum versatility in production inspection...

the NEW KODAK CONTOUR PROJECTOR, Model 4

You'll find setups are faster, fixturing easier when you use the Kodak Contour Projector, Model 4, for routine gaging of precision parts.

Designed for use on the inspection line, it has a movable table with 4 inches of travel in both horizontal and vertical directions. This lets you handle a wide variety of parts with simple fixturing.

The Kodak Contour Projector, Model 4, has the same unique optical system as the famous Kodak Contour Projectors, Models 2A and 3. The 14-inch viewing screen covers a field of 1.4″ at 10× magnification. Vertical illuminator, surface illumination, six-power lens turret, and rotating screen with protractor ring are available as accessories. For complete details, write to:

EASTMAN KODAK COMPANY
Special Products Sales Division
Rochester 4, N.Y.

the KODAK CONTOUR PROJECTOR

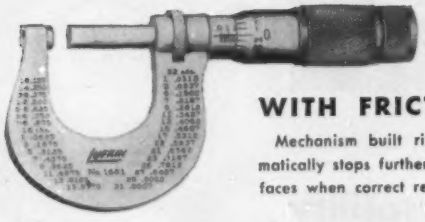
Kodak

18% BIGGER BARREL

Gives Faster, Easier More Accurate Measurements

There's more space between graduations making it easier to estimate fractions of thousandths. There are longer graduation lines and the rapid reading figures marking each thousandth are larger. Non-glare Chrome-Clad satin finish on the barrel gives you easy reading even in poor light. Lufkin micrometers are easiest to adjust, too — the reading line keeps its original position directly in line of vision and the thimble doesn't cover measurements on the hub.

New LUFKIN BIG BARREL MICROMETERS



WITH FRICTION THIMBLE

Mechanism built right into the thimble automatically stops further pressure on the measuring faces when correct reading is obtained.

WITH RATCHET CAP

A Lufkin exclusive! With the ratchet completely enclosed in the cap you can still take "one hand" measurements.

A Complete New Line To Exactly Fit Your Needs

In the new Lufkin Big Barrel Micrometers you have a choice of Friction Thimble, Ratchet Cap or Direct Feel only. You can have the exclusive new Lufkin Slip-Proof black crackle finish on the frame or Chrome-Clad satin finish. You can have any style with or without lock-nut. You can have carbide tipped anvil and spindle. The new Lufkin shorter design gives you better balance and the extended anvil and tapered frame permit you to take measurements in places inaccessible to other micrometers. You'll like the new Lufkin Big Barrel Micrometers — try the one of your choice today.

BUY LUFKIN TAPES • RULES • PRECISION TOOLS FROM YOUR DISTRIBUTOR

313 THE LUFKIN RULE CO., SAGINAW, MICHIGAN

132-138 Lafayette St., New York City • Barrie Ont.

Allmetal lock nut is a unitary, solid metal piece, slotted cone shape on one end, splined cylinder on other, designed to be inserted in a countersunk hole. Nut is partially or completely seated in material, and is held in position by force-fitted splines. After bolt is inserted, locking action is effected by pressure of the sector threads forced against the bolt by interference of the countersinks. Available in all metals and in all standard thread specifications.

Allmetal Screw Products Co, 811 Stewart Ave, Garden City, LI, NY

Precision-machined solid steel and stainless steel shaft collars, manufactured by Rockwood Pulley, are cadmium-plated with a zinc alloy to permit welding when necessary. Collars are equipped with hollow safety setscrews; bore size is clearly stamped on face. Available in standard specifications with bore sizes from ⅛ to 3 in. in a total of 43 sizes.

Rockwood Pulley Mfg Co, 20 Crosby St, New York 13, NY

Completely sealed, heavy-duty precision limit switch, identified as catalog listing 51MLI, may be mounted in almost any position in relation to the means of actuation. Operating head is easily adjustable to any of four horizontal positions, and roller may be reversed on the arm. Switch is listed for 20 amp, 110, 220, or 440 v, ac, ½ amp 115 v dc; ¼ amp 230 v dc; ¾ hp 110 v ac; 1½ hp 220 v ac.

MICRO SWITCH, Div Minneapolis-Honeywell Regulator Co, Freeport, Ill

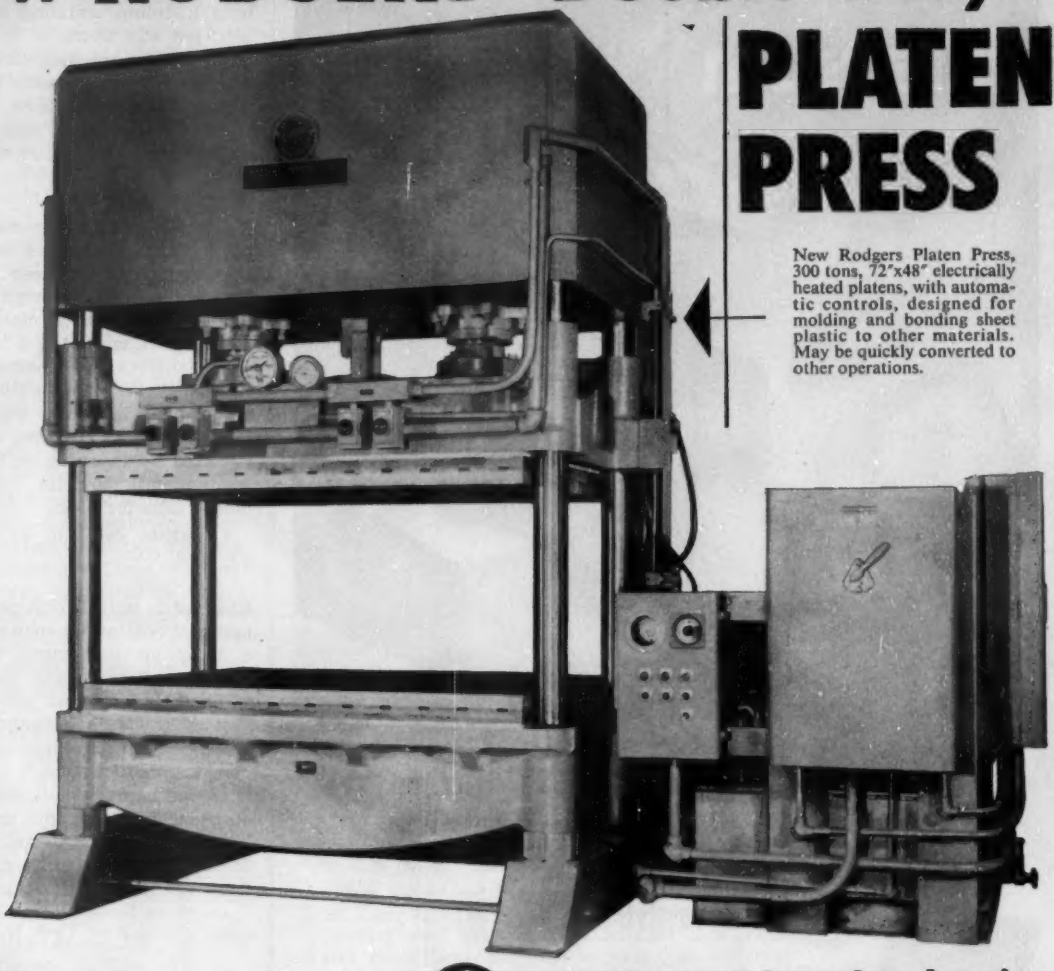
Pul-Pac and Pusher materials-handling units have been improved by Clark. Pul-Pac is a combination push-pull attachment that permits use of a thin carrying sheet instead of the conventional wooden pallet. The Pusher device, which does not have a gripper jaw on the rack, eliminates manual unloading of cartons, bags, drums, or other material stored on pallets. Both are available for use on gas and electric Clippers and Carloader model fork trucks.

Clark Equipment Co, Battle Creek, Mich

Straight line strainer, called Straitflo, has been designed to protect appliances, equipment, valves, and controls, and is said to provide clean, uninterrupted flow of water, air, or gas. Construction eliminates unnecessary friction, loss and turbulence; union couplings insure quick installation and cleaning. Available in ¼-, ⅜-, ¾-, and 1-in. pipe sizes.

Industrial Sales Div, Hays Manufacturing Co, 814 W 12th St, Erie, Pa

New RODGERS "Double Duty" PLATEN PRESS



New Rodgers Platen Press, 300 tons, 72″x48″ electrically heated platens, with automatic controls, designed for molding and bonding sheet plastic to other materials. May be quickly converted to other operations.

1 forms or draws metals

2 molds and bonds plastics in ONE operating cycle

Are you processing both metals and plastics? This newest Rodgers Platen Press is quickly converted for metal or plastic operations—a "double feature" advantage that means equipment savings for you.

Heated platens, which mold sheet plastic *and* simultaneously bond it to metal, rubber or other materials, are interchangeable with metal forming or drawing dies. By using pneumatic die cushions, the press can be converted for deep drawing of metals.

Rodgers "Double Duty" Presses are available in 10 to 500-ton capacities and with platen sizes from 12″x12″ to 72″x48″. Precision control equipment automatically governs platen movement, pressure, time cycles and temperature. Operator safety is assured by equipment design.

MANUFACTURERS. If you're processing metals and plastics you'll be interested in this double duty press; let us send you more information and also a copy of our catalog describing other Rodgers "Blue Ribbon" Presses for plastic and rubber molding, metal drawing and metal forming.

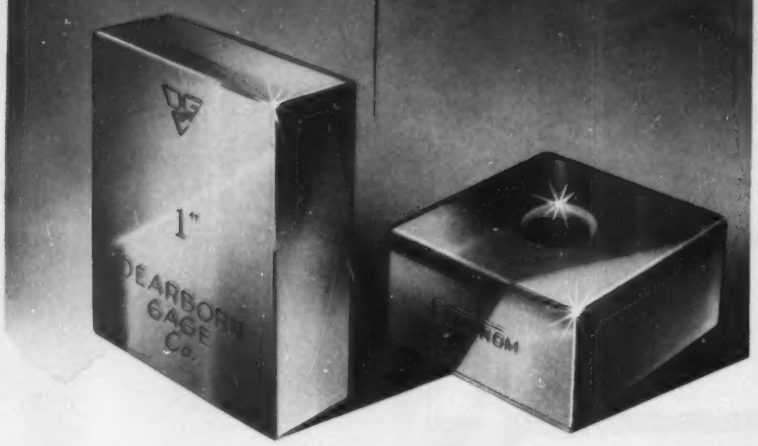
HYDRAULICS Rodgers KEEPS THE WORLD MOVING

Rodgers Hydraulic Inc.

7407 Walker Street • Minneapolis 16, Minnesota

Ellstrom

measuring in millionths for three generations



Here are GAGE BLOCKS that invite your most critical inspection!

WE'RE "fussy" about the gage blocks we make. And we hope, when *you* buy a set, that you'll be fussy, too. Because only by your own critical, impartial inspection of each individual block can you come to appreciate the true full measure of quality, value, and dependability inherent in Ellstrom Chromium Plated Standards.

Yes, we'd like you to check any set of Ellstrom gage blocks that meets your particular inspection or production requirements. Check them block-by-block for size . . . for their consistent adherence to closer than specified accuracy. For flatness . . . parallelism . . . and the finish of their hard, uniform chromium plated gaging surfaces that give you greater serviceability, longer wearing millionths. And, too, test the fine materials used in their manufacture . . . for coefficient of expansion and controlled metallurgical stability. Then, we're sure, you'll agree that it pays to standardize on Ellstrom Standards.

IF YOU BUY GAGE BLOCKS, send for your free copy of this new Ellstrom Standards Catalog. Contains complete specifications and prices on the entire Ellstrom line of gage block sets, accessories, individual blocks, wear blocks, inspection service and trade-in plan. Write today!

ELLSTROM STANDARDS DIVISION
Dearborn Gage Company • 22035 Beech Street • Dearborn, Michigan
Originators of Chromium Plated Gage Blocks

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

Adjustable, soft sponge rubber knee pads fit any size knee, are easy to put on, and comfortable to wear all day long, kneeling, standing, or walking. Will not slip down or come out of adjustment, according to the manufacturer. Non-slip waffle tread grips wet or slippery surfaces.

General Scientific Equipment Co, 2700 W Huntington St, Philadelphia 32, Pa

Swing-bin cabinets for storing small parts have six drawers, each 2½ in. wide by 1-1/16 in. deep by 9½ in. long, which swing from a sturdy bracket. Two screws mount bracket securely to wall, table top, underneath shelves or benches. Dividers furnished can separate plastic drawers into as many as four separate compartments. Drawers can be alternated by swinging on bracket for storing tall articles. Six-drawer model sells for $3.95.

Akro-Mils, Inc, 820 E Market St, Akron 9, Ohio

Rustend is both a rust-proofing primer and coating for new metals, and a touch-up compound for rusted surfaces. Transparent liquid forms a flexible, resistant adhering film that contracts and expands with the metal, despite temperature variations. Product, which contains no lead, can be flowed, dipped, sprayed, or brushed; sets in not more than 3 hr and dries hard in not more than 24 hr, ready for painting if desired, fully effective without painting.

American Sand-Banum Co, 9 Rockefeller Plaza, New York 20, NY

Special nut-wrench and applicator have been designed for use with Tinnerman nuts in tightening and adjusting templet set-ups. Both are made of ½-in. Parkwood, a composition material against which nuts don't slip. Both are 4½ in. long, so they can be maneuvered between connecting rods which normally are 5 in. apart. Setup builders simply place a nut in applicator notch, grip handle, and punch nut onto connecting rod.

Temco Aircraft Corp, PO Box 6191, Dallas, Texas

Magnetic Leco latch for cupboard or cabinet doors has no moving parts or springs. Complete unit consists of a powerful, compact, permanent magnet, special steel contact plate, and mounting screws. Latch has a polished, plated metal finished for corrosion-resistance. Price, 49¢.

Laboratory Equipment Corp, St Joseph, Mich

Chuck jaw blanks are available in nineteen standard sizes to fit approximately 273 master chucks. Are made of SAE 1020 steel accurately machined to American Standard Form. Can be used on any chuck having American Standard master jaws, including Cushman, Skinner, Warner & Swasey, and Union, by simply boring out the blanks to coincide and fit to hold parts to be machined.

Jergens Tool Specialty Co, 712 E 163rd St, Cleveland, Ohio

Two adhesives have been developed for bonding duPont's Mylar polyester film to a wide range of papers, plastic films, fabric. Bondmaster L272 is claimed to retain full bond strength after constant exposure to 320 F for 672 hours, at the same time offering greater electrical properties than previous formulations. Bondmaster L440 for bonding of Mylar to paper for sterilization-resistant applications is said to retain a strong, fiber-tearing bond without discoloring after being subjected to a live steam sterilization chamber for 30 minutes at 250 F.

Rubber & Asbestos Corp, Dept P, 225 Belleville Ave, Bloomfield, NJ

Glenn constant voltage welders for powering all metallic-arc automatic welding processes are now available in three new models. Improvements include wider arc voltage range of 18 to 42 v, remote vernier control of arc voltage adjustment, increased rectified capacity, and simplified construction. Three units have continuous-duty ratings of 500, 750, and 1200 amp, respectively, at 40 v.

Glenn Co, 3134 East 10th St, Oakland 1, Calif

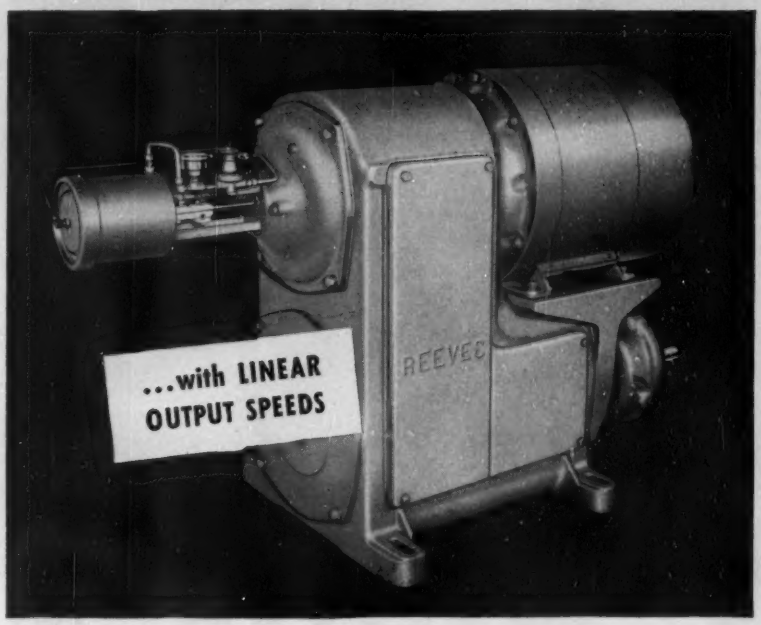
UNIONWELD stainless steel tubing is available in commercial production quantities. According to the manufacturer, improved production techniques and elimination of many unnecessary operations make it possible to sell the tubing at least 10% less than other pipe and tube now available. Product is produced in a size range of ¼ to 5 in. OD, with wall thickness of 0.010 to 0.154.

Union Steel Corp, Union, NJ

Logo Force P-85 for finishing phenolic plastic is said to have greatly improved hardness and adhesion qualities over conventional materials without resulting in embrittlement even on heat aging. Available in both pigmented and pigmented metallic forms.

Logo, Inc, 13799 South Avenue O, Chicago 33, Ill

New Automatic Speed Control for Continuous Processing



REEVES

Auto-Pneumatic Control

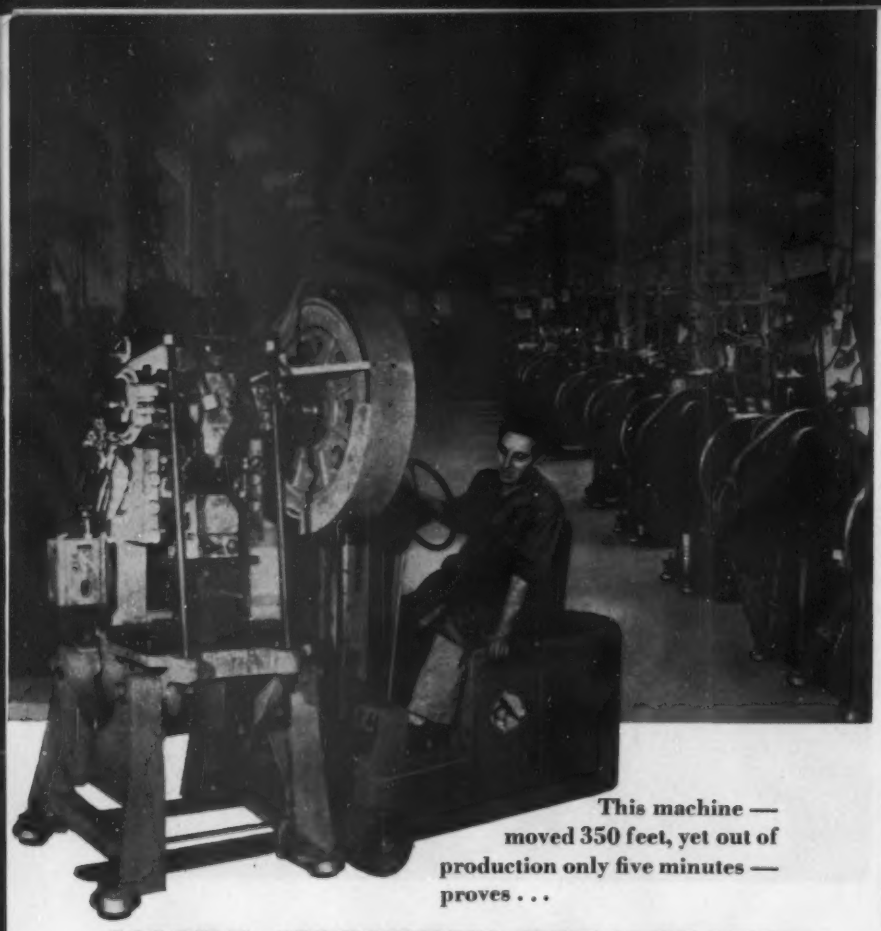
Now with the REEVES Vari-Speed Motodrive equipped with the new sensitive Auto-Pneumatic control, you can automatically control continuous processes involving the regulation of heat, liquid level, pressure, temperature, flow, and many other variables. Positive, direct connection from the pneumatic instrument to the Auto-Pneumatic control assures accurate and sensitive speed regulation.

Exclusive REEVES cam design provides linear output speeds so necessary for delicate proportioning processes . . . maintains the greatest accuracy while regulating or maintaining any speed throughout the range of the Motodrive.

REEVES Auto-Pneumatic Control assures maximum efficiency and economy in industrial processes . . . means outstanding savings for you in material, fuel and labor costs plus continuous uniformity of your product or process. Write today for complete information.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Send today for
BULLETIN A13-M542



This machine — moved 350 feet, yet out of production only five minutes — proves . . .

MOBILE MACHINERY CUTS COSTS

1 No lagging or cementing because the resilient mount isolates vibration and shock in all directions — machines won't walk.

2 Leveling is simple and fast — just turn the cap screw and tighten the lock nut — no shimming is necessary.

Leveling Barrymounts let you install machines anywhere, without fastening them to the floor. This means you gain machine mobility. Your product costs can be cut because mobile machinery gives you flexible production layouts. Machine maintenance and reject costs are cut because damaging external shocks are isolated. Installation costs are cut because requirements for expensive foundations are eliminated — no lag bolts to set or shims to drive, yet machines will not walk.

Write today for your free copy of LOOK — NO LAGGING and learn how you can save money with Barrymounts.

THE BARRY CORP.

703 PLEASANT STREET
WATERTOWN 72, MASS.

SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

Truetemp input controller, added to an existing on-off temperature control system, maintains heating temperatures as close as ±0.2 F. Instrument can be used with all heating systems, regardless of size, operating temperatures, or fuel, provided present control instrumentation is thermocouple-actuated. Model 1700-115 is available for 115 v, 50/60 cycle lines, and Model 1700-230 for 230 v, 50/60 cycle supplies. Outside dimensions are 7x10½x5 in.

The Winslow Co, 9 Liberty St, Newark 5, NJ

Instrument, called a differential converter, has been developed to measure the level of liquids in a closed tank, either under pressure or vacuum. The 28-lb device converts differential pressure into proportionate air pressure, which in turn is transmitted to indicators, recorders, and controlling equipment. Range is readily adjustable in field applications from 0-14 to 0-200 in. of water. Unit can withstand temperatures up to 350 F, and is rated for pressures of 750 or 1500 psi. Further information in Bulletin 2221.

Minneapolis-Honeywell Regulator Co, Industrial Div, Wayne & Windrim Aves, Philadelphia 44, Pa

Hetron is a tough, corrosion-resistant polyester resin combining fire resistance, light stability, and superior electrical and structural properties. Can be combined with glass fiber for plastic car and truck bodies, corrugated and flat panels for indoor and outdoor use, and for special pipe for use where fire is a constant hazard.

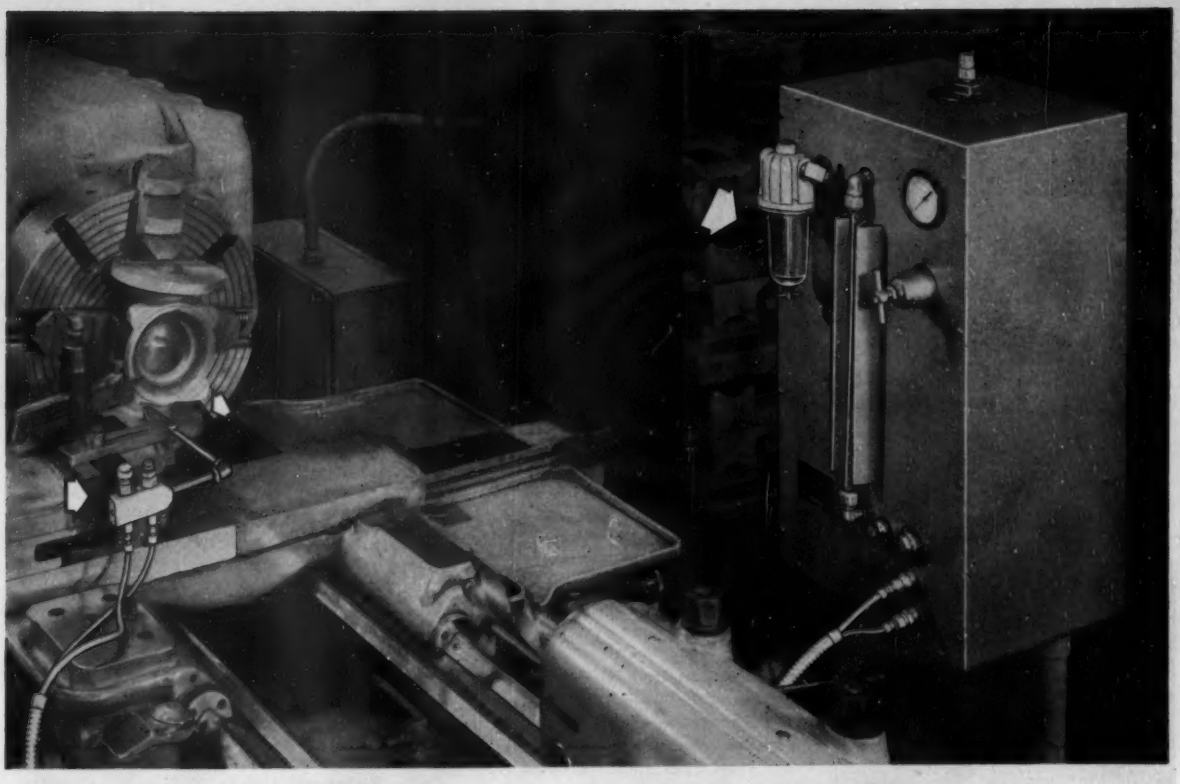
Hooker Electrochemical Co, Niagara Falls, NY

Ballymore Safety-Step ladders are equipped with rubber feet on all legs; flared formation increases floor contact area by 400%. Rubber grip engages floor when user steps on ladder. Ladders are available in 115 standard types, up to twelve steps, with a choice of three safety treads.

The Ballymore Co, Wayne, Pa

Model 3620 Rivett valve to meter flow in one direction and allow free flow in the opposite direction has an anodized aluminum body and a nylon poppet. Recommended for 150 psi air, or 300 psi oil or water, the ⅜-in. size valve has a 3-in. length by 1⅛-in. hex, and weighs only 6 oz. Priced at $6.25.

Rivett Lathe & Grinder, Inc, Boston, Mass



LO-JET ACRO

'TURNS-OFF THE HEAT' } turns-up profits and production

Lo-Jet Cools And Lubricates

Lo-Jet ACRO is a pressurized mist system that provides both evaporative cooling of tools and work, and lubrication, to reduce friction generated heat. Because it's pressurized, Lo-Jet delivers cooling and lubrication uniformly, too, regardless of operational conditions.

Lo-Jet Pays For Itself In Reduced Costs

Lo-Jet ACRO increases tool life 100%-300%, and the resultant savings in tool cost alone soon pay for the unit. The Lo-Jet costs less to operate, too.

Lo-Jet Increases Production

With Lo-Jet ACRO on the job, you can take heavier cuts on any work, and operate at higher feeds and speeds. And because tools last longer, there is a drastic reduction in the amount of tool-change time required.

Lo-Jet Provides Better, Cleaner, Safer Operation

The directed cooling and lubrication of Lo-Jet ACRO result in improved finishes. Lo-Jet leaves the tool and work plainly visible and clean at all times. The ACRO coolant used is fireproof, lightly pine-scented, absolutely non-toxic to humans.

Lo-Jet Is Versatile And Easy To Install

Lo-Jet ACRO is completely self-contained, and can be installed on any cutting machine in minutes! It eliminates expensive, messy pumps, sumps, and piping. It can be used in turning, grinding, milling, drilling, tapping, and reaming. It's ideal for multi-phase, high speed operations, because it can be used to control as many as six nozzles at once, with full pressure and separate controls for each tool.

Don't let your profits and production go up in smoke! Mail the coupon now for literature that tells how to improve all cutting operations with

LO-JET ACRO

AIR CONVERSION RESEARCH Corporation

3025 N. Western Avenue • Chicago 18, Illinois

GENTLEMEN: Please send me literature that fully describes the new Lo-Jet ACRO.

Name_____

Company_____

Address_____

City_____ Zone____ State_____ AM-9

Distortion is Controlled in BRAD FOOTE'S DEEP CASE HARDENING

The BRAD FOOTE
***DEEP* CASE HARDENING process has been perfected to a degree which practically eliminates distortion**

GEARS RUN TRUE

No place is distortion control more important than on heavy duty gears which are run almost continuously at full rating and subjected to extreme shock loads such as are encountered in rolling mill operations. BRAD FOOTE **DEEP CASE HARDENED** gears run true and distribute the load evenly across the full face and on the designed bearing surfaces of each tooth.

HARD TOOTH SURFACES

In addition, BRAD FOOTE rigidly controls to set standards the depth of **DEEP CASE HARDENING** and the carbon content. The tooth surfaces are of maximum hardness for long life, but the carbon content is gradually diminished at successive depths below the surface until it blends to the metal of the core itself.

SHOCK-RESISTANT CORES

Thus the cores of the teeth and the body of the gear remain ductile and shock-resistant while the teeth are given an increase in service life of over 50%.

ASK FOR QUOTATION

It will pay you to try a set of these gears on your toughest job. Send your specifications today for quotation.

BRAD FOOTE *makes* Spur, Bevel, Helical, Spiral Bevel, Herringbone, Zerol, Worms, Worm Gears, Reducers, Transmissions

BRAD FOOTE GEAR WORKS, INC.

1309 South Cicero Avenue • Cicero 50, Illinois
Bishop 2-1070 • OLympic 2-7700 • TWX: CIC-2856-U

subsidiaries

AMERICAN GEAR & MFG. CO.
Phone: Lemont 920
Lemont, Illinois

PITTSBURGH GEAR COMPANY
Phone: SPaulding 1-4600
Pittsburgh 25, Pennsylvania

Aerosol paint remover formula producing a foaming action said to be faster, cleaner, and more active than brush-applied types is available free of cost to aerosol loaders. Slushy snow-like deposit obtained increases activity of remover by holding solvents in contact with paint or varnish better than brushed-on compounds. One application of remover by aerosol method may be equivalent to two brush applications. Additional data in Bulletin KTM-16.

Du Pont Co, Kinetic Chemicals Div, Wilmington, Del

Freon-13 is a non-flammable and non-explosive refrigerant designed for systems producing temperatures in the range of –70 F to –150 F. It is adaptable for use in compact, economical, hermetic compressors. Typical applications include metal toughening, ageing of steel, shrink-fitting of metals, and most types of low-temperature aircraft testing work. Available in 5-, 9-, 23- and 80-lb cylinders.

E I du Pont de Nemours & Co, Wilmington, Del

Keystone Grade Z-2 high density alloy steel is said to provide the highest physical characteristics presently attainable in powdered metal products. When molded and heat treated, parts have an ultimate tensile strength of 115,000 psi, with hardness of Rockwell C-30. Manufacturer states it is now possible to fabricate powdered metal parts such as gears, cams, rollers, of this alloy, designed for heavy duty service.

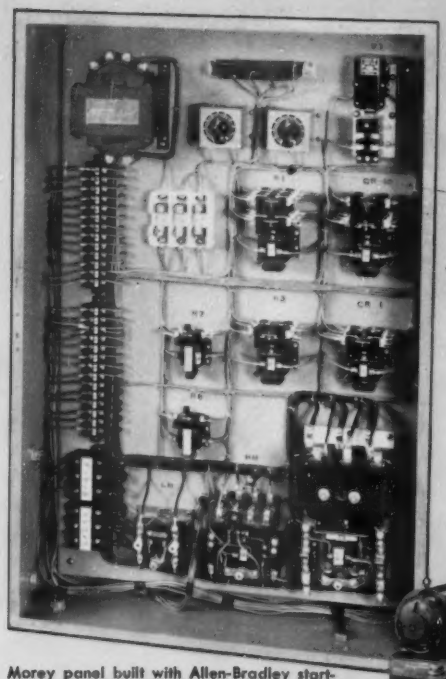
Keystone Carbon Co, St Marys, Pa

All-State metal-filler is a cold-applicable, waterproof, rustproof, non-shrinkable solder that reportedly will not crack, chip, or peel. Product, spreadable by spatula, putty knife, or rubber squeegee, hardens into metal. Has tensile strength of 650 psi; once dry and hard, solder stands temperatures to 360 F and is not affected by cold to – 40 F.

All-State Welding Alloys Co, Inc, 249-55 Ferris Ave, White Plains, NY

440 Series of small bellows valves has been specifically designed for highly corrosive applications, high vacuum work, and mass spectrometry. Pipe sizes available are ⅛ to ½ in., with ¼- and ½-in. Swagelok tube ends. The ⅛- and ¼-in. valves are available with air-operated motor for remote operation.

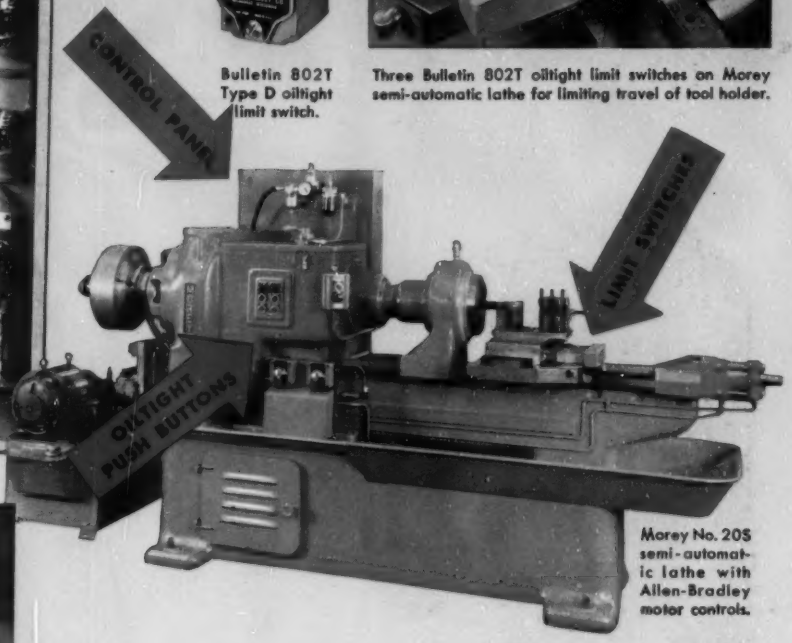
Hoke, Inc, 199 South Dean St, Englewood, NJ



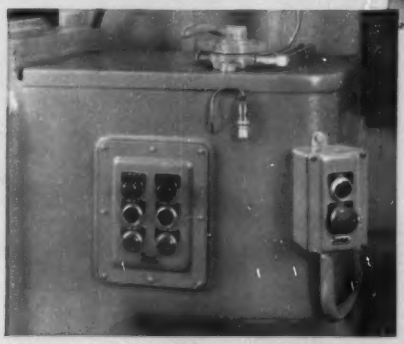
Morey panel built with Allen-Bradley starters, relays, timers, and terminal blocks.

Bulletin 802T Type D oiltight limit switch.

Three Bulletin 802T oiltight limit switches on Morey semi-automatic lathe for limiting travel of tool holder.



Morey No. 20S semi-automatic lathe with Allen-Bradley motor controls.



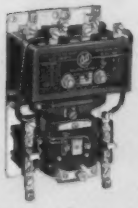
Close-up of Bulletin 800T oiltight push buttons on Morey lathe. They control spindle and pump motors.

Add a Sales Asset to your Machine Tools by standardizing on A-B MOTOR CONTROLS

With the growing trend toward AUTOMATION, electric motor controls are items of critical interest to machinery buyers. They recognize the A-B trademark as a label of QUALITY for the Allen-Bradley starters, relays, contactors, timers, drums, limit switches, and push buttons. So, why not standardize on Allen-Bradley motor controls and enjoy the benefits of a prestige line of quality control units? It will not only assure reliable performance of your machines but add another touch of quality appearance . . . a distinct sales asset.

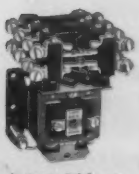
An Allen-Bradley sales engineer will gladly recommend the best combination of controls for the maximum output of your machines. Why not phone your nearest Allen-Bradley office, today?

Allen-Bradley Co., 1316 South Second St., Milwaukee 4, Wisconsin



Bulletin 709 Size 2 solenoid starter.

Bulletin 709 Size 1 solenoid starter.



Bulletin 700 solenoid relay—Universal type.

Bulletin 849 pneumatic timing relay.

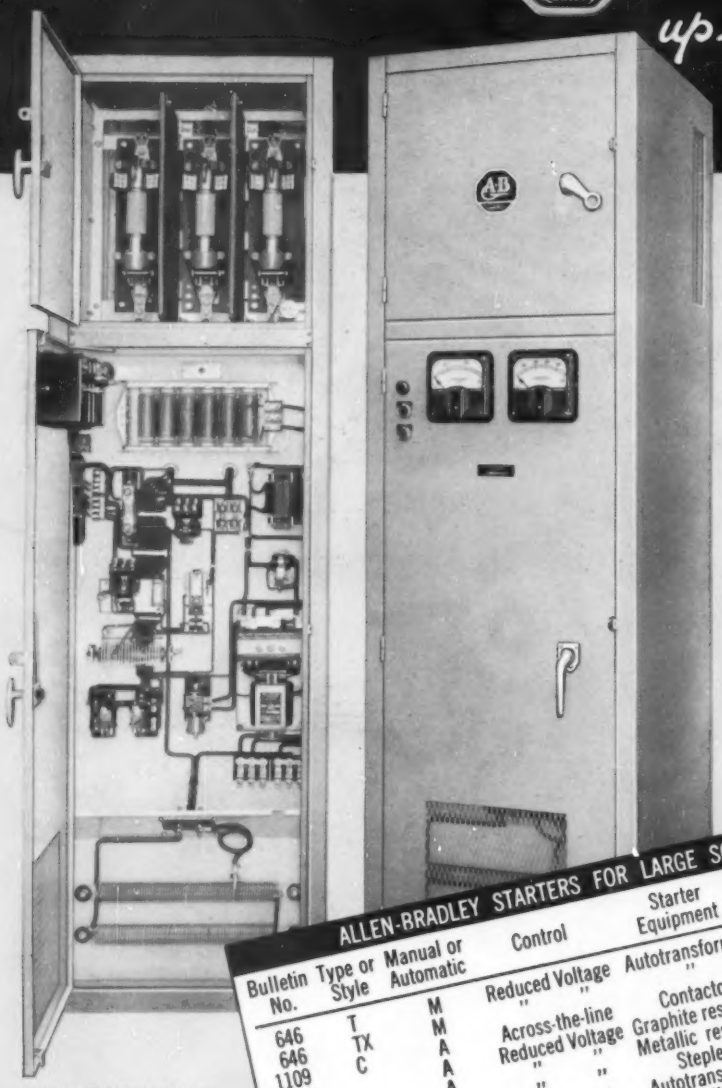
ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

A-B Quality

8-54-R

LIFETIME A-B STARTERS

up to 1500 HP



Bulletin 906 Style C high voltage synchronous motor starter with current-limiting fuses. Self-protecting against short circuits up to 150,000 kva on 2500 volts or 250,000 kva on 2501 to 4600 v. The high tension, solenoid operated, across-the-line oil-immersed switch is mounted in oil tank behind the panel. Cabinet has hinged doors on front and back.

There are 14 different types of these rugged Allen-Bradley starters. (See listings below.) Some are of the across-the-line type . . . but most of them are reduced voltage starters using resistors, transformers, or reactors during the starting period.

These starters are available in 2500 to 4600 volt ratings for squirrel cage motors from 700 to 1250 hp, and for synchronous motors from 800 to 1500 hp. They are listed for squirrel cage motors from 125 hp, 220 v to 600 hp, 440-550 v, and for synchronous motors from 350 hp, 220 v to 700 hp, 440-550 v.

For complete details, please send for the A-B Handy Catalog.

ALLEN-BRADLEY STARTERS FOR LARGE SQUIRREL CAGE MOTORS

Bulletin No.	Type or Style	Manual or Automatic	Control	Starter Equipment	Maximum Horsepower at Rated Voltage 220V	440-550V	2000-2500V	2501-4600V
646	T	M	Reduced Voltage	Autotransformer	125	250	700	1250
646	TX	M	" "	"				
1109	C	A	Across-the-line	Contactor	200	200		
740		A	Reduced Voltage	Graphite resistors	300	600		
741		A	" "	Metallic resistors	300	600		
742		A	" "	Stepless	300	600	700	1250
746	CT	A	" "	Autotransformer				
1146				"				

ALLEN-BRADLEY STARTERS FOR LARGE SYNCHRONOUS MOTORS

Bulletin No.	Type or Style	Manual or Automatic	Control	Starter Equipment	Maximum Horsepower at Rated Voltage 220V	440-550V	2000-2500V	2501-4600V
906	A	A	Across-the-line	Contactor	350	700	800	1500
906	C	A	" " "	"				
914		A	Reduced Voltage	Resistors	250	250		
922	AT	A	" "	Autotransformer	350	700	800	1500
922	CT	A	" "	"			800	1500
922	CR	A		Reactor				

8-54-R

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY

TROUBLE-FREE MOTOR CONTROLS

QUALITY

Heavy-duty limit switch 101ML1 combines precison, two-circuit switching with rugged construction. Use of a snap-action spring accomplishes simultaneous make and break of both contacts (of both the normally-closed and normally-open circuits). Durable aluminum enclosure makes it particularly useful as a control of two isolated circuits in applications where switch is subjected to severe shock and impact. Two-circuit double-break basic switch ITBI-1 has been designed for reversing circuit applications where space is at a premium. Switch measures ½x½x¼ in.

MICRO SWITCH, Div Minneapolis-Honeywell Regulator Co, Freeport, Ill

SpaceMaster Model "M" is designed with side entry to provide more operator safety and prote··n; wrap-around compartment ı reinforced steel shields driver against collision. Electric foot brake in the compartment allows operator to control braking action without bending the knee; releasing pressure on left heel applies brake. High lift models have capacities of 2000 and 3000 lb; low lift, 4000 lb.

Lewis-Shepard Products, Inc, Dept R-45, Watertown, Mass

Viking magnetic liquid level control, operating on the conductivity principle, is designed for liquid temperatures up to 600 F, pressures up to 500 psi, and an ambient temperature range of 0 to 150 F. With stainless steel probe the only part to be immersed in liquid, freedom from normal operating difficulties is said to be assured by absence of floats and other moving parts. Electrolysis is eliminated since current passing through fluid is limited to a maximum of 5 ma ac.

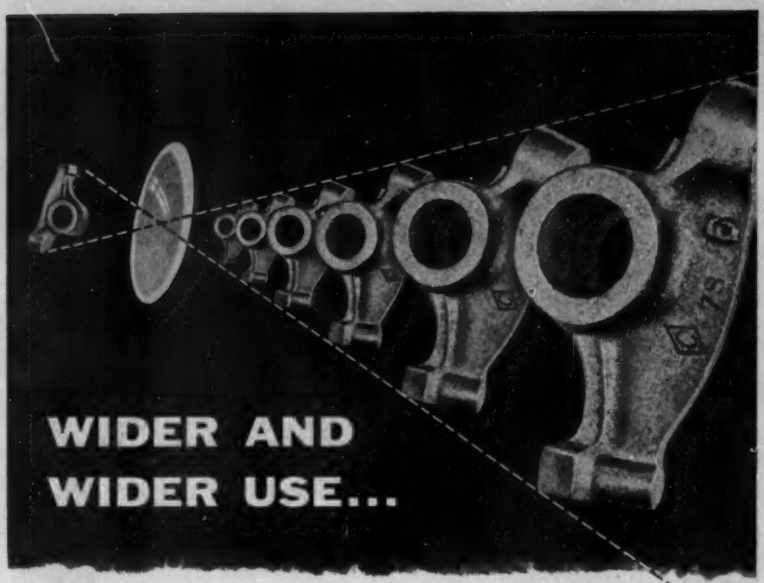
Viking Instruments, Inc, East Haddam, Conn

Cocor Cr-39 is an optically clear cast plastic said to be shatterproof, scratch-resistant, impervious to both heat and corrosive fumes. One of its current uses is as a dial cover for the Ashcroft Duragauge, pressure gage manufactured by Manning, Maxwell & Moore.

Cast Optics Corp, Riverside, Conn

Six new colors have been added to Krylon's acrylic spray coating line, for use on any paintable surface. Available in 12-oz pressure container in Machine Gray, Light Gray, Chrome Yellow, Cherry Red, Hunter Green, and Regal Blue.

Krylon, Inc, 2038 Washington Ave, Philadelphia 46, Pa



PEARLITIC MALLEABLE CASTINGS as engineers see its many advantages

DESIGN ADAPTABILITY: Because of its good fluidity, it can be cast in thin sections and in complicated shapes.

HIGHER STRENGTH: Ultimate strengths range between 60,000 and 90,000 psi; yield strength between 40,000 and 70,000 psi.

EASILY MACHINED: Machinability index (B1112 Steel = 100) ranges between 80 and 90.

WEAR RESISTANCE: Withstands excessive wear under heavy loads at high speeds.

LOCALIZED HARDENING: Sections of the casting can be flame hardened or induction hardened before or after machining.

BEARING PROPERTIES: Good non-seizing properties in metal-to-metal contact.

FINE FINISH: Can be given a very smooth finish where desired.

You will find many applications for Pearlitic Malleable castings – particularly as a replacement for forgings, stampings and weldments – where reduced weight, less machining time, fewer assembly operations and better appearance are important production and sales considerations.

A-9277

NATIONAL MALLEABLE AND STEEL CASTINGS

M&S EST. 1868

COMPANY
Cleveland 6, Ohio

The Nation's largest independent producer of malleable and pearlitic malleable

OUT OUR WAY

I'VE SEEN DOZENS DO IT-- AN' DONE IT MYSELF FOR YEARS! RIGHT AFTER SPENDING ALL MY DOUGH ON CHRISTMAS I STALKED AROUND FOR A FEW DAYS WITH A FIRM RESOLVE TO BECOME A BOSS AN' EARN MORE DOUGH!
YOU'RE JUST JEALOUS BECAUSE HE TOLD THE BULL ABOUT SOL-SPEEDI-DRI FOR THESE FLOORS! DOESN'T LEAVE YOU ENOUGH TO GRIPE ABOUT!
THE WONDER BOY
J.R.WILLIAMS

For clean, safe floors

SOL·SPEEDI·DRI

Industries large and small have acclaimed Sol-Speedi-Dri the leader among oil and grease absorbents. That's because wherever slippery, dirty floors cause trouble, Sol-Speedi-Dri does a bang-up "dry-cleaning" job, covers plenty of floor area, and can be used again and again. Consistent high quality is insured by strict laboratory controls. Why not try it on your floors? Send coupon today for a free sample!

SPEEDI-DRI CORP. 210 W. Washington Sq., Philadelphia 5, Pa.

Warehouse stocks maintained in principal cities of the United States and Canada.

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Inquirers in New York, New England, and New Jersey should write to Speedi-Dri Corp. Elsewhere in U.S. to Waverly Petroleum Products Co., 1724 Chestnut St., Phila. 3, Pa. In Canada, G. H. Wood & Company Ltd., Toronto. Branches throughout Canada.

FREE SAMPLE Fill out the coupon and mail today for free sample and literature.

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AM-9/54

H-VW-M elevator-design plating conveyor reportedly plates steel propeller blades 30 to 50% faster than a former manual handling system. Blades are automatically transferred from and back to plating conveyor. Transfer conveyor is selective in that it only picks up those blades that are supposed to be recycled; other blades remain on the plating conveyor and are delivered to unloading station in back of plating tank. Unit, with a lift of 10½ ft, is hydraulically operated and has provisions for by-passing or delaying set-down over any station in the plating cycle.

Hanson-Van Winkle-Munning Co, Matawan, NJ

Bernz-O-Matic portable propane torch can be operated in any position and in confined working areas. Unit is instant lighting, and requires no pumping, priming, or preheating, even in sub-zero temperatures. Easily adjustable flame burns up to 2300 F. Small and large soldering tips are available for wide use in soldering wires, pipes, tubing, fittings, as well as a flame spreader for heating large surface areas. Torch, with burner and cylinder, sells for $6.95.

Otto Bernz Co, Inc, 280 Lyell Ave, Rochester, NY

Line of retractable caster sets is available which will fit all types of Delta industrial metal and woodworking power tools normally mounted on steel stands, making each of these tools portable. Casters can be lowered into rolling position by means of a foot lever. When machine is in position and ready for use, light step on pedal raises the wheel, allowing power tool to rest solidly on floor. Price, $9.95.

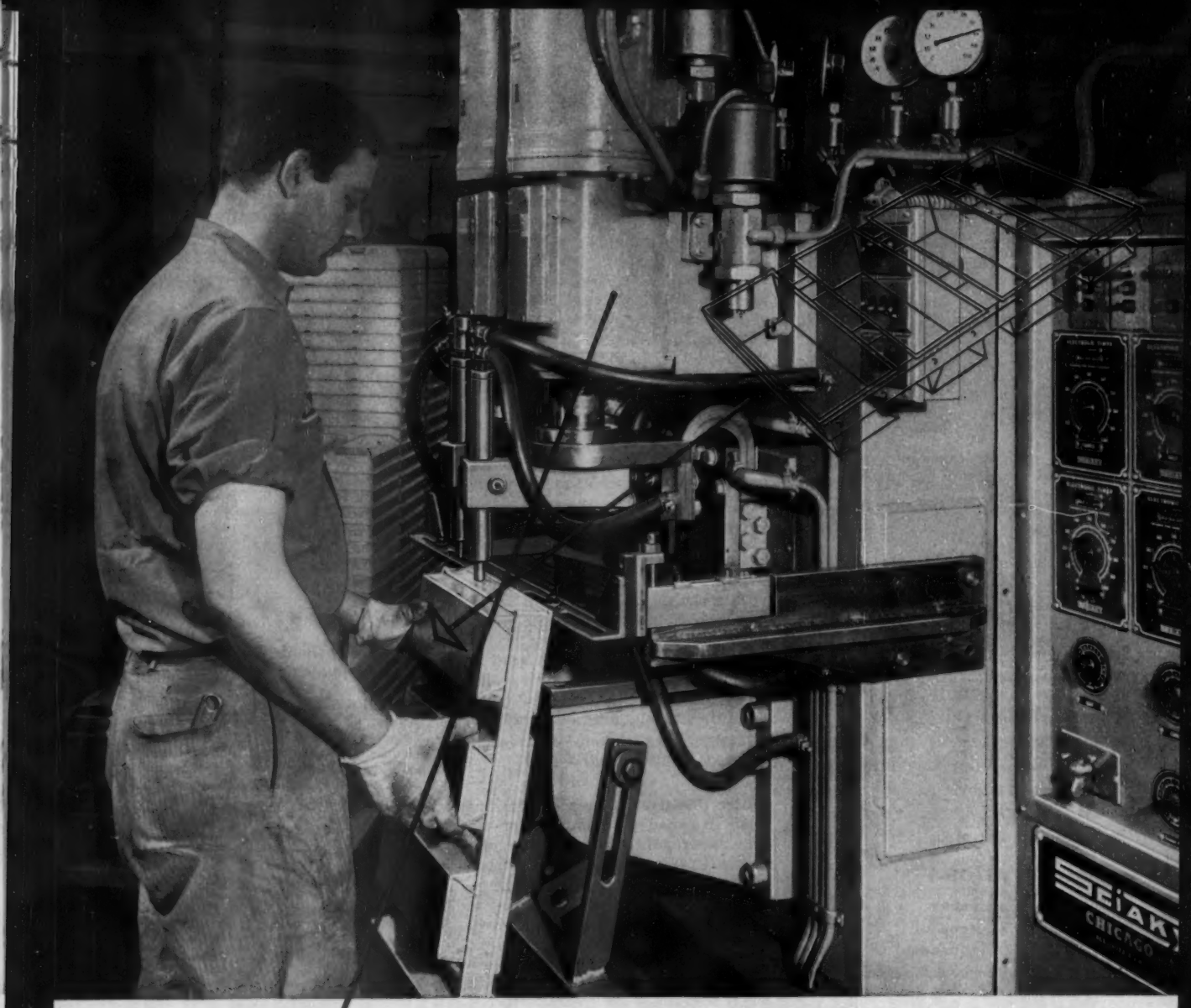
Delta Power Tool Div, Rockwell Manufacturing Co, 431 North Lexington Ave, Pittsburgh 8, Pa

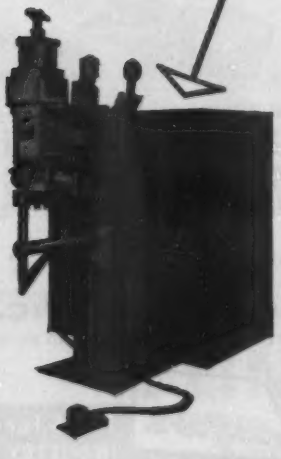
3R aluminum asbestos roof coating, tested in a one-coat brush application, dropped roof temperature 24 deg in ten minutes, and continued to drop until it approached temperature in the shade.

Colonial Refining & Chemical Co, NBC Bldg, Cleveland 14, Ohio

Kel-F coated silicone rubber O-rings are said to be particularly useful where resistance is needed to aromatic, chlorinated, or other solvents that normally attack silicone rubber. Temperature range is approximately –120 F to +390 F.

Bacon Industries, 192 Pleasant St, Watertown, Mass





Sciaky Three-Phase Spot Welding Cuts Cost of Stronger, More Sanitary, Aluminum Bread Pans

The Lockwood Mfg. Co., Cincinnati, Ohio, active in the development of aluminum bread pans for the commercial baking industry, uses Sciaky patented Three-Phase spot welding to maintain the quality their reputation demands.

The Three-Phase principle of operation, pioneered and invented by Sciaky, offers many distinct advantages over conventional single phase—such direct savings as lower installation costs, lower power costs, no expensive current compensators, greater welding consistency, and longer electrode life.
Sciaky Three-Phase is acceptable to many, many installations where single phase is not. Write for the complete Three-Phase story in Bulletin 137.

Lockwood's use of Sciaky Three-Phase welders is completely described in "Resistance Welding at Work," Vol. 3 — No. 10. Another fine example of Sciaky basic thinking — welders designed to do *more useful work* at *lower operating cost* with *maximum reliability.*

Largest Manufacturers of Electric Resistance Welding Machines in the World

SCIAKY

SCIAKY BROS., INC., 4933 WEST 67th STREET, CHICAGO 38, ILLINOIS

NEW
L&J PRESS

A new ruggedly built press with the capacity, rigidity and accuracy for a wide variety of precision work. It has the time-tested L&J features that give you more value for your money through better and more efficient press work.

SPECIFICATIONS

Strokes per minute	120
Ram stroke, standard	2½"
max. stroke (to order)	4"
Ram overhang, center of ram to frame	6¾"
Die space, standard*	8¼"
special,* up to	12¼"
Bolster plate area	21½"x 13"
Opening through back	10"

* bed to ram, stroke down, adjustment up

Let our local distributor show you the benefits of putting L&J Presses to work for you. 17 O.B.I. models—flywheel and backgear types—6 to 80 ton capacities. All available with L&J — Fawick Air Clutches for high-speed production.

Write for literature

L&J PRESS CORPORATION
1629 STERLING AVENUE
ELKHART, INDIANA

Solder, called AluTin 51, has been developed for production, filling, sealing, and repair operations upon wrought and cast aluminum alloys. Core of this specially compounded alloy is a liquid flux which is said to have exceptional wetting properties. Melting range is between 400 and 500 F. Tensile strength up to 7000 psi. Any type of heat source may be used. Material reportedly gives excellent results upon steel and other metals.

Eutectic Welding Alloys Corp, 40-40 172nd St, Flushing 58, NY

Extra large worktable for attaching to the Preis-Panto Model 2D-4 engraving machine is 18x24x1-in. thick and is so constructed as to be readily mounted on top of the existing worktable of that model. Permits use of standard clamps for holding work by means of four T-slots that run length of table, and it is provided with a clamping T-square for lining up work, an extension for the worktable crank handle so that adjustment of the table position can be made conveniently. Also provided with four mounting bolts for quick mounting to standard worktable.

H P Preis Engraving Machine Co, Industrial Branch, Hillside, NJ

Water line flow volume control has been designed to maintain one set flow rate regardless of variable inlet pressures. Control will automatically compensate for surges in line pressure, and pressure drop is preset to deliver one constant rate anywhere between 0.2 gpm and 14 gpm. Will maintain operating accuracy of 10% within variable range of 15 — 150 psi, according to manufacturers. Available in ¼, ⅜, and ¾-in. pipe sizes.

Industrial Sales Div, Hays Manufacturing Co, 816 West 12th St, Erie, Pa

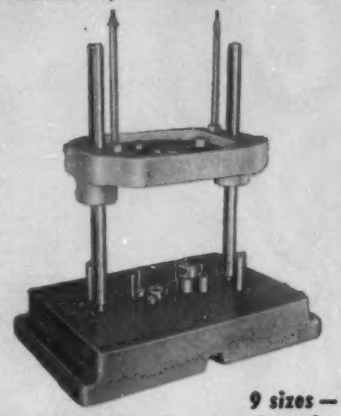
Eye Savers "Clip-On" side shields add deep cup side protection to safety spectacles of any size or shape. Clear or green acetate shields are easy to attach and remove because of positive clip holders.

Watchemoket Optical Co, 232 West Exchange St, Providence, RI

Replacement silicone-rubber ear inserts for the Lee Sonic Ear-Valv have been reduced in price from 50c to 30c per pair. In addition, the silicone rubber inserts are said to be a marked improvement over the original gum rubber inserts.

Sigma Engineering Co, 1491 N Vine St, Los Angeles 28, Calif

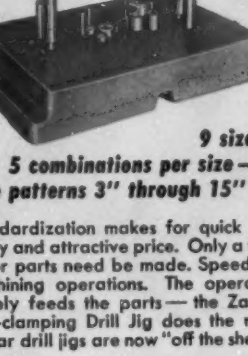
Zagar Self-clamping
DRILL JIGS
NOW STANDARDIZED for
DRILLING, REAMING, TAPPING



9 sizes —
5 combinations per size — for hole patterns 3" through 15" dia.

Standardization makes for quick delivery and attractive price. Only a few minor parts need be made. Speed up machining operations. The operator merely feeds the parts — the Zagar Self-clamping Drill Jig does the rest. Zagar drill jigs are now "off the shelf".

◆ ◆ ◆



Zagar drill jigs can be used in conjunction with Zagar gearless multiple-spindle drill heads to ream, drill, and tap on standard drill presses and tapping machines. Or, Zagar can quickly supply the complete "package" unit.

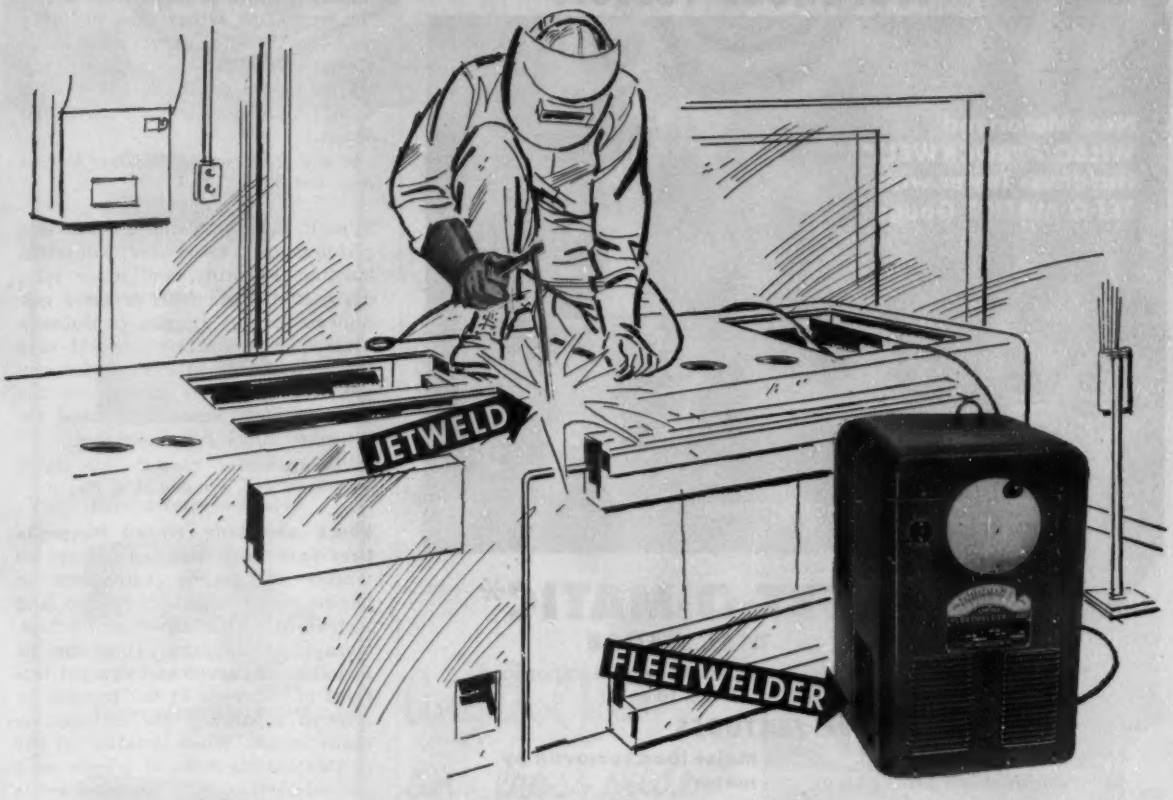
◆ ◆ ◆

Write for New Bulletin "A-9".

ZAGAR TOOL, INC.
24000 LAKELAND BLVD., CLEVELAND 23, O.

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

LINCOLN "JETWELDING"



...industry's greatest team for low cost, high speed hand welding

Lowest manual welding costs are achieved with "Jetweld", the high speed welding electrode developed and introduced by Lincoln, and "Fleetwelder"—Lincoln's AC transformer-type welder.

For the first time, "Jetweld" utilizes powdered metal in the electrode coating... enabling use of higher currents to speed welding. Iron powder becomes an additional source of metal for the weld. Welds are more uniform, free of undercut, of X-ray quality.

THE RESULT: Average increases in speed of 35%... *and more.*

CHECK LINCOLN'S NEW LOW PRICES Lincoln's new combination of lower AC machine prices and faster welding with "Jetweld" can cut your welding costs. See for yourself. Have your Lincoln representative check your requirements for electrodes and welders. Call or write.

THE LINCOLN ELECTRIC COMPANY

Dept. 2006

CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

Wilson "Rockwell"* Hardness Testers

SET-O-MATIC* DIAL GAUGE

Eliminates human error. Operator merely applies minor load and taps depressor bar. No setting of dial to zero.

OTHER FEATURES

- Major load applied under dash pot control
- Major load removed by motor
- Illuminated Dial Gauge
- Illuminated Penetrator

Eliminates Operations... Increases Tests per Hour

All you have to do with the Model Y WILSON "ROCKWELL" Motorized Hardness Tester is apply the minor load and tap the major load depressor bar. The machine does everything else automatically. The cycle of Major Load operation may be less than 2 seconds.

This speed of test means great savings in time which will reduce your hardness testing costs. Yet it is done to Wilson's high standard of accuracy.

The utter simplicity of setting the SET-O-MATIC* dial gauge eliminates human error. The operator does not have to set the dial. The large pointer is automatically brought to "SET" position when the minor load is applied.

The Model Y Motorized WILSON "ROCKWELL" Hardness Tester is in production and orders are being accepted for early delivery. Write today for descriptive literature and prices.

*Trade Marks

ACCO

Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

230-B Park Avenue, New York 17, N. Y.

Triple E portable clamp is a toggle-action device designed to fit the grip. Readily adapts itself to any surface, whether round, smooth, or irregular. No-marring and resistance-to-oil factors are said to result from use of Neoprene tips rather than ordinary rubber. Available in two sizes: Model 400 with 1-in. jaw capacity and 1⅜ in. throat depth, and Model 405 with 1¾ in. jaw, and 2¾ in. throat depth.

E & E Engineering Co, 15023 Harper Ave, Detroit 24, Mich

Type P, propane Torch-O-Matic is a pistol-shaped torch for soldering, burning, sweating, and other jobs, designed for use with propane gas. Squeeze of the trigger produces a control flame — a fine pinpoint, or a full 6-in. flame, as desired for any job. Unit connects directly to the propane tank, eliminating need for intermediate valve apparatus.

Velocity-Power Tool Co, 201 North Braddock Ave, Pittsburgh 8, Pa

Shock-absorbing, ribbed Neoprene tires have been designed for use on wheels of gravity conveyors to handle safely fragile materials and instruments during manufacture, storage, or shipping. Tires can be installed on curved and straight sections of conveyor at the factory, or ordered separately for sections already in use. When installed on one or two outside rows of wheels on a curved section, they keep materials aligned and tracking perfectly.

The Rapids-Standard Co, Dept BT, 342 Rapistan Bldg, Grand Rapids 2, Mich

Safety-Walk brand waterproof non-slip surfacing with a mineral coating of traprock has been developed especially for pulley lagging. Can be spiral-wound or applied in sections. Type E requires a separate adhesive; Type F is manufactured with a pressure-sensitive adhesive backing. Surfacing, said to be fire retardant, economical, resistant to oil, grease, and water, is available in rolls up to 24 in. wide.

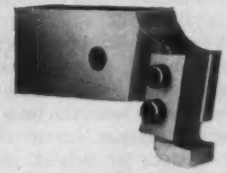
Minnesota Mining & Manufacturing Co, 900 Fauquier St, St Paul 6, Minn

Oakite Composition No. 191 is a material for electrocleaning copper and its alloys prior to plating. Cleaner is said to posses special ingredients that reduce tarnishing of work in the higher-temperature cleaning ranges, or where long treating cycles or prolonged transfer periods may occur.

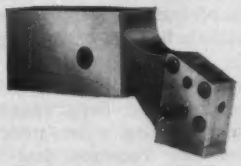
Oakite Products, 124 Rector St, New York 6, NY

GREENLEE *Automatics*

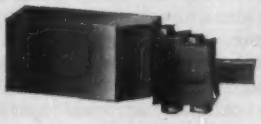
Circular Form-Tool Holder



Dovetail Form-Tool Holder

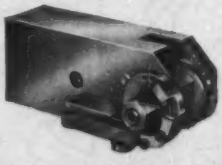


Bit-Type Form-Tool Holder



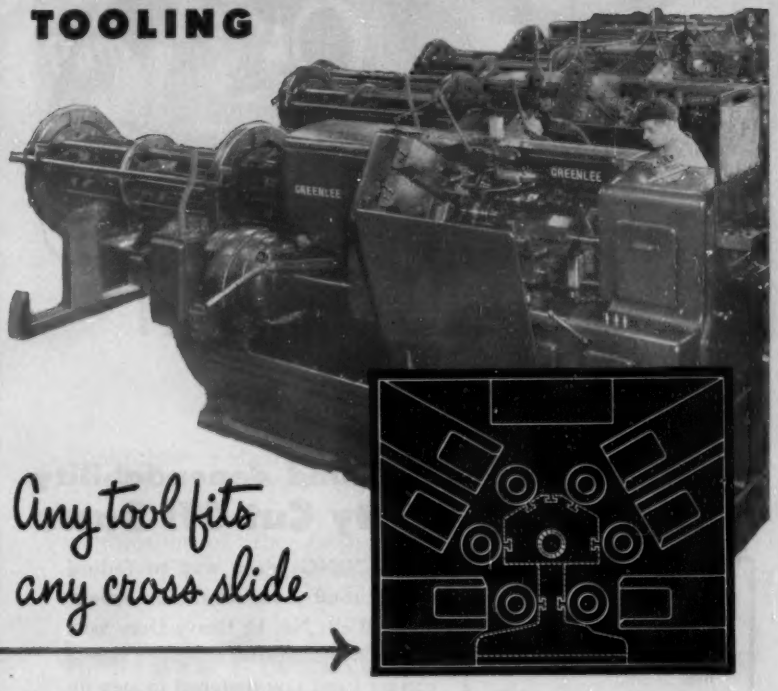
Cut-Off Tool Holder

Knurling Tool Holder



Stencilling Wheel Holder

INTERCHANGEABLE TOOLING



Any tool fits any cross slide

SAVE TIME AND MONEY
REDUCE JOB COSTS

Among the cost-saving features of Greenlee Automatics, one of the most advantageous is the arrangement whereby *any* of various standardized tool holders will fit in *any* of the six cross-slides. This means not only no limitations as to what tools can be used in which positions, but also a minimum requirement for investment in tools, and a maximum of speed in tool setting when changing over between jobs. *You can profit* from this and the many other outstanding features of Greenlee Automatics.

Write for FREE *Literature*

Send today for your copy of our 20-page booklet describing and illustrating all the Greenlee features.

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1729 MASON AVE., ROCKFORD, ILL.

now . . . more important than ever . . .

the efficiency, economy and dependability of Wells Heavy-Duty Cut-Off Saws

DESIGN DETAILS

- Cutting action parallel to bed.
- Easily controlled depth cutting.
- Automatic frame return and blade motor shut off.
- Large capacity — 12" x 16", rectangular; 12¾", rounds; die blocks; 12¾" deep, 16" wide, 18" clearance bed to blade.
- Selective speeds: 60, 115, 200, 300 Ft. per min.
- Ample power: 1 H.P. blade motor, ⅓ H.P. hydraulic system motor.
- Weight: approximately 1845 lbs.

Coupled with the Wells-O-Bar Feed Master (an optional extra) the Wells No. 12 becomes a fully automatic cut-off machine. Ask for further information.

SEARCHING for a way to reduce metal cut-off costs? Here's an answer —the Wells No. 12 Heavy Duty Saw. It's a hydraulically operated, metal cutting band saw designed to step up production with greater accuracy and eliminate unnecessary hand labor in cut-off work. Featuring an automatic cutting cycle, the Wells No. 12 also provides controlled blade tensioning, parallel-to-bed cutting and a wet cutting system.

For the efficiency, economy and dependability that you need to meet that "tougher competition ahead," find out more about the Wells No. 12. Ask your Wells Dealer for full information or write direct to the factory.

Wells-Cams

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICHIGAN

ROUND TABLE *Discussion*

DECIMAL DITHER

Which is easier for all-around shop use — decimals or fractions? Would the average shop man rather write or read a dimension as 33/64 in., or as 0.515625? Does the extreme accuracy of the decimal system counterbalance the familiarity of long-time use of fractions?

YOU CAN'T blame some of the oldtimers in a shop for spinning into a decimal dither when confronted, without warning, by a new kind of number system on working plans. However, in this case, the new single-number system has merit over the present system of mixed fractions and decimals on plans. In my opinion, the adoption of a uniform system of indicating all dimensions in decimals has been too long overdue.

It has been my experience in various engineering departments that standard drafting room practice in dimensioning requires that dimensions of parts that can be measured or that can be produced with sufficient accuracy by using an ordinary scale should be written in units and common fractions. Parts requiring greater accuracy should be dimensioned in decimals. Where dimensions call for accurate machining with small tolerances, then the total dimension should be given in inches and decimals. Accurate dimensions

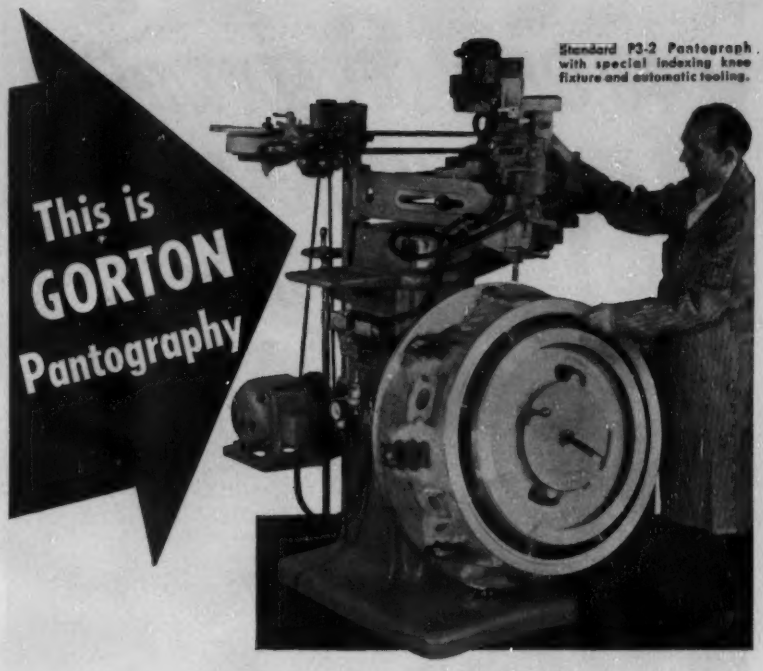
"Now where did I put my safety glasses?"

which are to be established with limit gage or micrometer should be expressed in decimals to at least three places, and the drawing should give the maximum and minimum limits between which the actual measurements must come. Although this standard practice of mixed fractions and decimals has been long in use, I think it's time for a change to straight decimal dimensioning.

In the ordinary dimensioning for surfaces to be machined, my practice has been to work to inches and fractions. In dimensioning close-fitting parts, only decimals were used. In general, when fractions were used the limit of accuracy required was not less than 0.010 in. With the demand for interchangeability and quantity production, the exact size in decimals was specified for essential dimensions, with the amount of tolerance over and under to be allowed, since it was not possible to work to an absolutely accurate dimension. These limits were set by the engineering department and the shop was required to follow orders explicitly. I have found that much experience in manufacturing is needed as well as a study of the particular mechanism involved, before the draftsman is able to know just the accuracy necessary and specify proper tolerances. When unnecessarily small tolerances are set, the cost of manufacture is greatly increased. To assure accuracy in manufacturing and avoid errors in following plans, especially where close work is involved, it would seem to me that a uniform method of specifying dimensions in decimals merits adoption and presents no serious problem for use in the shops.

I believe that the decimal dimension system is superior to the fraction system because it is more easily applied where tolerances are involved, and renders possible a uniformity of dimension expression on plans. With the decimal system a simpler form for addition and subtraction of figures is possible than with fractions, and it is thus better fitted for general application in the shop. Calculation by shop workers is made easier. It is only after the adoption of the decimal system that easy methods for adding, subtracting, multiplying, and dividing are possible. Numbers in decimal notation can more easily be handled than the intricacies of fractions.

It is common usage in most drafting rooms for dimensions to be specified in fractions for ordinary work and dimensions given in decimals instead of the usual fractions for work within a certain fixed limit of



Standard P3-2 Pantograph with special indexing knee fixture and automatic tooling.

...Ready to Help You

Photo shows a standard P3-2 profiling ports in an aircraft part, a large aluminum-alloy casting. The sides of each port are parallel; one end has a true radius, the other end is parabolic. A combination of other methods would do the cutting in hours, but the P3-2, with an automatic cutting cycle, finishes each port in 2.3 minutes.

Improve Production and Lower Costs

Gorton tracer-controlled equipment does efficient profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving and many other standard or special operations. You can expect high accuracy and high surface finish, whether your work involves metals or plastics in flat, uniformly curved, cylindrical or irregular shapes.

Enlarged templates, masters or patterns, all quickly and easily made, give Gorton Pantographs advantages of increased accuracy through reduction ratios. Work pieces range in size from the diameter of a dime to 10 feet. Cutting cycle is accomplished manually or automatically.

Fill out and mail the coupon for your copies of the Gorton catalog and the informative booklet, "Pantography."

GEORGE GORTON MACHINE CO.

1509 Racine St., Racine, Wis., U.S.A.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1509

Firm .....

Name .....

Title .....

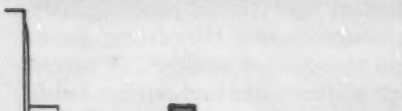
Address .....

City, State .....

A 7786-3/5

$48,000 SAVED with a REED Thread Rolling Attachment

ON AN AUTOMATIC SCREW MACHINE



Thread: **No. 8-32 NC-3**
Material: **Steel - B1113**
Thread Length: **3/8"**
Attachment Size: **300-G2A**
Machine: **9/16" RA-6 Acme-Gridley**
Rolling Position: **4th**
Production Rate: **450 pieces per hour**

Consistent concentricity maintained with the body of the part. Scrap loss was negligible. Machine down time for setup and changing rolls approximately 8 minutes per 100,000 pieces. Roll life averaged 300,000 pieces per pair of rolls for a total of 8 million pieces.

WRITE FOR THREAD ROLLING ATTACHMENT BULLETIN 1-21

REED ROLLED THREAD DIE CO.

THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS
Worcester, Massachusetts, U. S. A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

830

accuracy or tolerance. However, in view of the easier and quicker use of decimals, it would appear to be the better part of simplification and efficiency to adopt the decimal system for all dimensions on a plan.

Indicating all dimensions on a plan in whole numbers and decimals is practicable and desirable both from an engineering and shop standpoint. It contributes to clear and accurate working drawings. However, suggestions by shop men pertaining to any phase of product design and working plans should be encouraged. Experience has shown that shop criticism of design plans often brings changes which facilitate economical and practical manufacturing. Shop suggestions on engineering-fixed tolerances should be considered. Undue refinements, as tolerances more accurate than needed, add appreciably to costs, and from a use standpoint much unwarranted expense is incurred to hold close limits on unimportant parts. However, the progressive shop man will hardly fail to accept the innovation of decimal dimensions on plans and the elimination of fractions. He will see the advantage of a device which will facilitate the use of working plans and make his work easier. It will eliminate the unnecessary time spent in perusing conversion tables.

It should not require much study to get a clear impression of what is entailed in a uniform dimensioning system by anyone who has the mechanical experience to use a drawing at all. In fact, the elimination of the confusing fractions makes the important part of the drawing much clearer. It is not an unnecessary refinement but a better way to convey information to the man who uses the plan in the shop. In addition, decimal dimensions will be more convenient for the workmen because they will not require the addition or subtraction of fractions to arrive at a necessary dimension.

Production, Inspection, and Design Departments benefit when a uniform number system is used on all working drawings. The method of speci-

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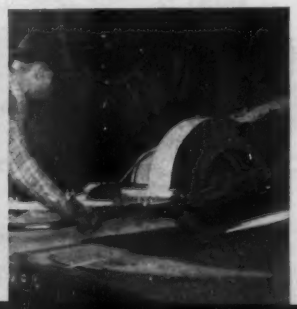

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fying engineering drawing dimensions is primarily a function of the designer; it should not be influenced by the conflicting opinions of different workers in different departments. Where the engineering department considers it essential to adopt a uniform method of specifying dimensions, it might be a good policy to inform the shop foremen in advance of the use of the new method so that it will not come as a complete surprise and they will be able to give timely instructions to their men.

In order to forestall difficulties in adoption of the decimal system in lieu of fractions it might be a good idea to get criticism from a Design Committee consisting of supervisory representatives of the Engineering, Production, and Inspection Departments. Some plants have such a committee set up to consider problems involving new designs, changes in design, and related problems affecting the manufacturing and inspection of present products or proposed new ones. If the shop has valid objection to the new number system it can best be brought up in the Design Committee before adoption.

There should be no "decimal dither" when it is realized that in actual practice the decimal system is simpler and less confusing than the inconsistency of mixed decimals and fractions on one plan. The shop man would be lax indeed not to take advantage of having the engineering department do the fraction conversion for him and have the finished information on the blueprint ready for his immediate use.

It's going to take some re-educating to pry some men loose from the old system where they use fractions for all dimensions that don't have special tolerances. As far as tolerances are concerned, most shop men will admit they are easier to show with decimals. For example, when a general tolerance is indicated on a plan, you can show plus-or-minus five thousandths by simply dropping the last digit on the number. When you have a special tolerance, you use the nominal dimension, and just add the tolerance on the end. Then you can add and subtract the tolerance directly and get your limits without converting a fraction.

I remember in times past when it was the practice in the ordinary dimensioning for surfaces to be machined to work to inches and sixteenths, so that the usual dimensions were in fractions ½, ¼, ⅛, 1/16, 1/32, 1/64. With closely fitting parts the older practice was to mark both parts with the same dimension and add a note such as "drive fit," "running fit," "loose fit," "shrink fit," etc, leaving the amount of allowance to the machine shop. That was before the days of decimal dimensioning of close-fitting parts.

It has been my experience that most modern engineering departments will lean over backward to follow the best practice in drafting plans to insure that the product designed will be manufactured with the greatest accuracy and lowest cost. Along these lines is the practice of some design departments of making separate drawings for the pattern shop or forge shop and the machine shop. When separate drawings are made for these shops, the machine shop drawing contains only the dimensions for machining the piece. The separate drawing system prevents congestion of the dimensions and thereby makes the drawings easier to work from. Some engineering offices prepare for all castings a

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set of pattern drawings for the exclusive use of the pattern maker. Separate forge drawings are usually made when a piece is to be machined from a forging. These drawings are to scale and show the completed forging in the stage ready for the machine shop, with all the dimensions needed by the forge shop. No dimensions for finish are given, but the outlines of the finished piece are shown in light dash-lines within the contour.

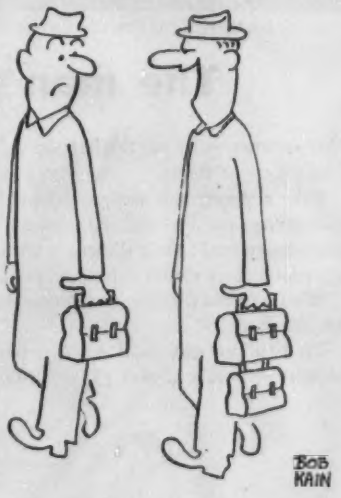
Where the engineering department takes such pains to assure accuracy it would be small potatoes for the shop man to get himself into a dicimal dither because he has to modify his way of thinking away from the traditional and out-moded mixed fractions and decimals system. It's clearly up to the foreman to get his doubting-Thomas worker to break through the barrier of his set way of unprogressive thinking.

You can't mix good eggs with bad ones to get a good omelet. Neither can you mix fractions and decimals on a plan to get the best delineation of specific information for accurate manufacture of the desired product.

Harry Kaufman
Philadelphia, Pa

THE EXTREMES of anything are bad. This applied to the use of decimals as well. However, in our modern industry most of our shops have become familiar with the decimal system. It is only in the shops who are not working on precision parts or complex mechanisms that one finds drawings with high percentage of fractions.

We would be foolish to try to build close-fitting parts by the use of fractions. It would require a complex



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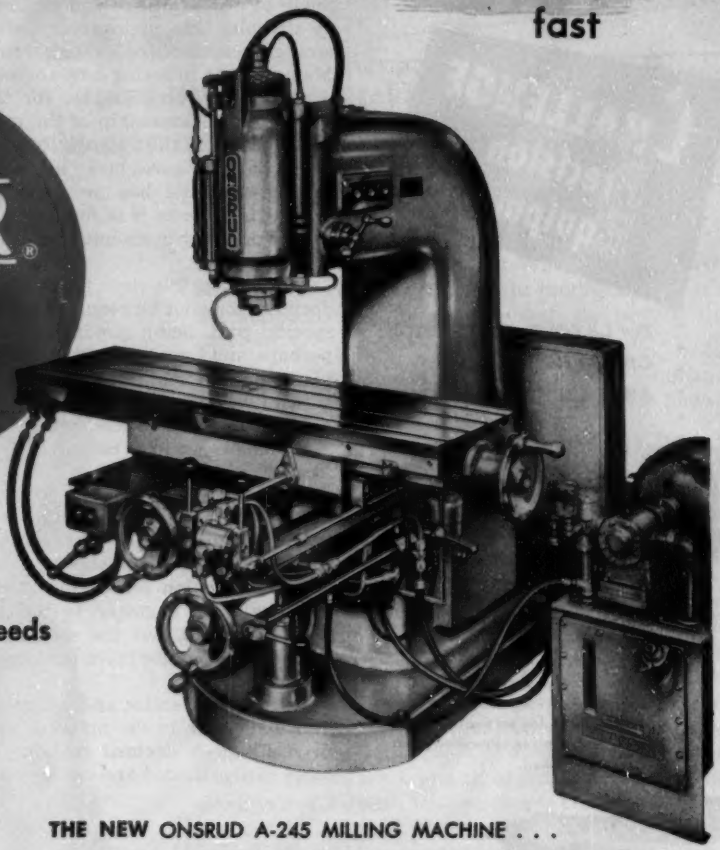

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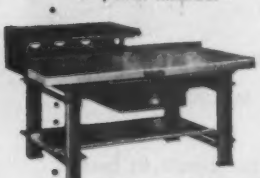

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system of tolerances in fractions running into figures of the 1/256 or 1/412 of an inch. Who knows the meaning of them? An extreme, in fractions, yes, but certainly not in decimals. For the 0.005 or even 0.001 of an inch are now a common set of figures appearing on drawings.

Perhaps some comment should be made of our drawings and decimals as a whole. Our engineers are often strange people, doing strange things. Many delight in seeing how complex a drawing they can make, for this shows the workmanship of the engineer. He, in most cases, has no idea what the figures mean in a shop. Furthermore, he has no desire to learn. His interest is in drawing and the work which goes into the drawing.

In the shop the close tolerance in decimals may not be required for the specific part being produced. Yet, perhaps, and I say this cautiously, the parts with which this specific part is to go may require that the part be held to close tolerances, which are synonymous with careful, close work.

Probably re-education of both the shop and the engineers would serve to good purpose. Yet who can get these things accomplished? Cooperative education for engineers can help train an engineer to see the shop viewpoint, but the shop must be open-minded, for there is no training for them.

We speak of scales and calipers—both today are in decimals for ease in reading. A decimal certainly is more easily divided and can be more

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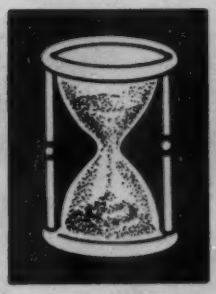
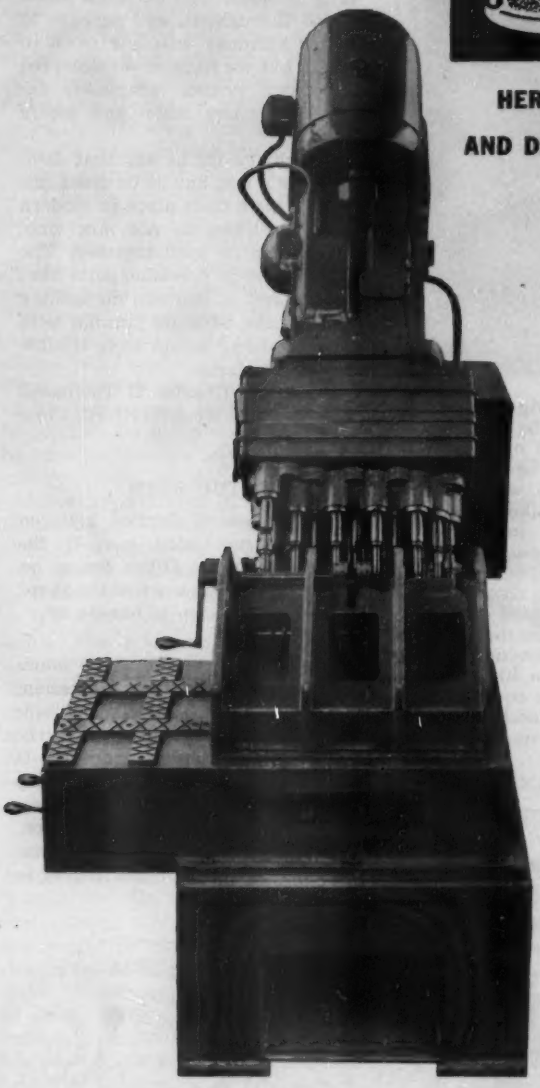
WHEN TIME COUNTS  COUNT ON TURNER



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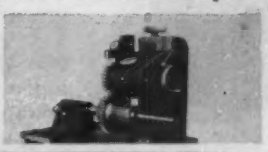

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useful in the shop, for fractions do not add easily, nor do they subtract.

It has been found that shops who have used decimals, and have men who work on close work, think in terms of decimals. They convert fractions to decimals, for to mix the two is nearly impossible.

It is probable that decimals could be used throughout, and perhaps to a better harmony with the work in general, but we have never accepted the decimal system completely except as a system when and where needed.

In summary let us say that decimals have a use, and so do fractions, and both have their place in modern industries. They do not mix well, but they can be used together. The shop working on precision parts likes decimals and in fact can do nothing without them. Men are familiar with hem and many would have trouble in using fractions.

Charles D Townsend
West Hartford, Corn

SETUP STEW

Is there danger of friction between union and non-union men if the Master Mechanic's Office insists on doing special setup work in the shop? What's the best way to handle it?

IN THE interests of industrial efficiency it is essential that draftsmen, methods engineers, and like individuals come into the shop and dirty their hands with some special jobs. If such workers shoulder aside the shop men in a brusque manner, they can naturally expect some opposition. The trade unionist will not say that his feelings are hurt, but will drag in

"Good heavens . . . I just happened to think . . . the suggestion I put in is going to do away with our jobs . . ."

the union angle to back up his arguments, and as an excuse to cloak his injured dignity.

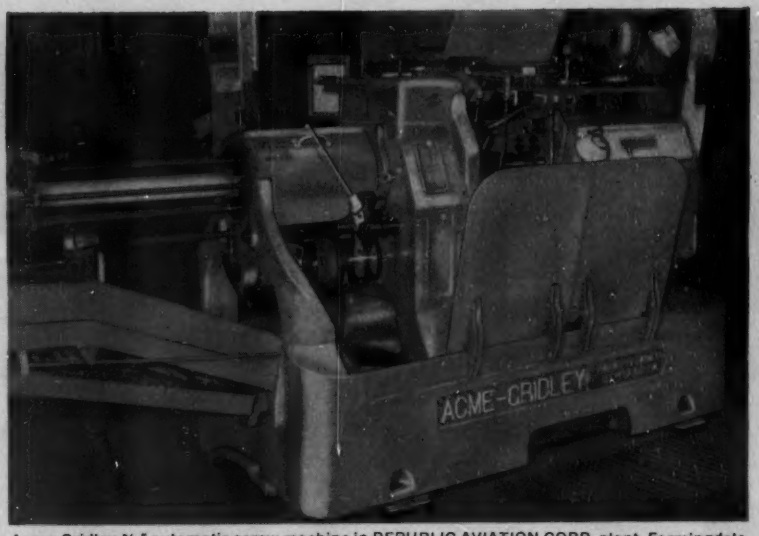
Assuming that shop discipline and order are maintained by the shop foreman, his permission should be asked and his cooperation sought in any case where a practical experiment is to be carried out on a machine tool. After all, the drafting room chief would soon raise a howl if shop men could wander in and out of his office at will. Some drafting rooms are absolutely private, so far as machinists are concerned; therefore, the machine shop should be extended all possible courtesy when it is to be used by drafting room or design staff.

Actually, no shop man's corns will be trodden if shop experiments are carried out in a proper manner. The first procedure is to tell the foreman what is wanted in the way of machines and facilities. If machine sections are run by section leaders under the foreman, then the particular section leader concerned should be brought into the preliminary discussion.

After ascertaining that the machine required can be made available for experiment, without upsetting the shop loading program, the next step is to ask that the machinist or the setter who is normally working on that machine be made available to assist in the experiments. This might appear to be a long-winded way of getting around the job of setting up an experiment, but I have done a lot of this work and have found it to be the smoothest procedure.

The actual machine operator is of tremendous help in trying out experiments on machines; he has clamps, toolbits, and can select feeds and speeds instinctively, besides operating the machine without the danger of causing expensive errors. A lot depends, of course, on the type of shop organization. When you are working with skilled operatives, their assistance is extremely valuable and any draftsmen or design engineer who tried to operate a complicated machine tool better than its usual attendant would only succeed in looking foolish. He must avoid looking foolish at all costs because the friendly warfare existing between shop and office types is an international state of mind; peace and mutual cooperation can only be obtained by upholding the dignity of the two opposing forces.

Having got his machine and his operator, the director of the experiment must then try to get the best results from these resources. He



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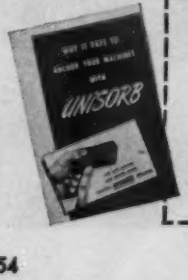

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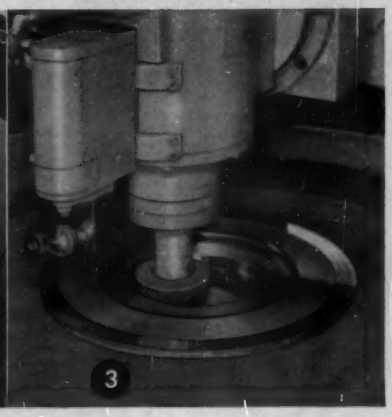

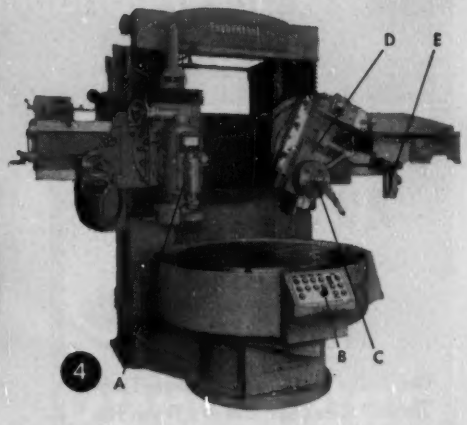

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...about the pictures

PHOTO 1 shows how the operator uses a Series 3100 machine to finish bore the inside diameters preparatory to grinding operations.

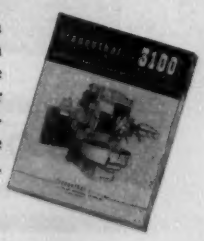
PHOTO 2 shows the machine's contouring attachments being used to face the top surfaces of a workpiece.

PHOTO 3 shows how the machine performs close-tolerance finish grinding of the workpiece's top surfaces and inside diameter, to assure concentricity and squareness of related surfaces.

PHOTO 4 illustrates (a) grinding spindle with graduate swivel mounting, (b) push-button control panel, (c) five-station tool turret, (d) hydraulic actuated turning slide, (e) hydraulic tracer control (optional).

May we help you?

If you'd like further information on how the Series 3100 precision turning and grinding machine can give you production and/or tool room advantages — our engineers are at your service. Write for informative bulletin No. 301.

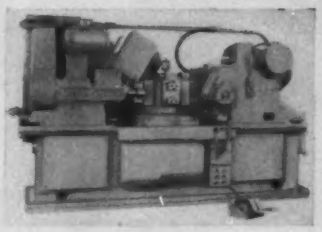


...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.



A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW
PRODUCT-QUALITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

should tread warily. If there is any heavy lifting to be done, it is better if he offers assistance rather than stand around with his hands in his pockets. He should not, however, interfere with the job that the operator is doing at any particular moment. In fact, an attitude of humble respect for the machinist's slickness in handling the machine should be maintained and is all part of the mutual respect build-up.

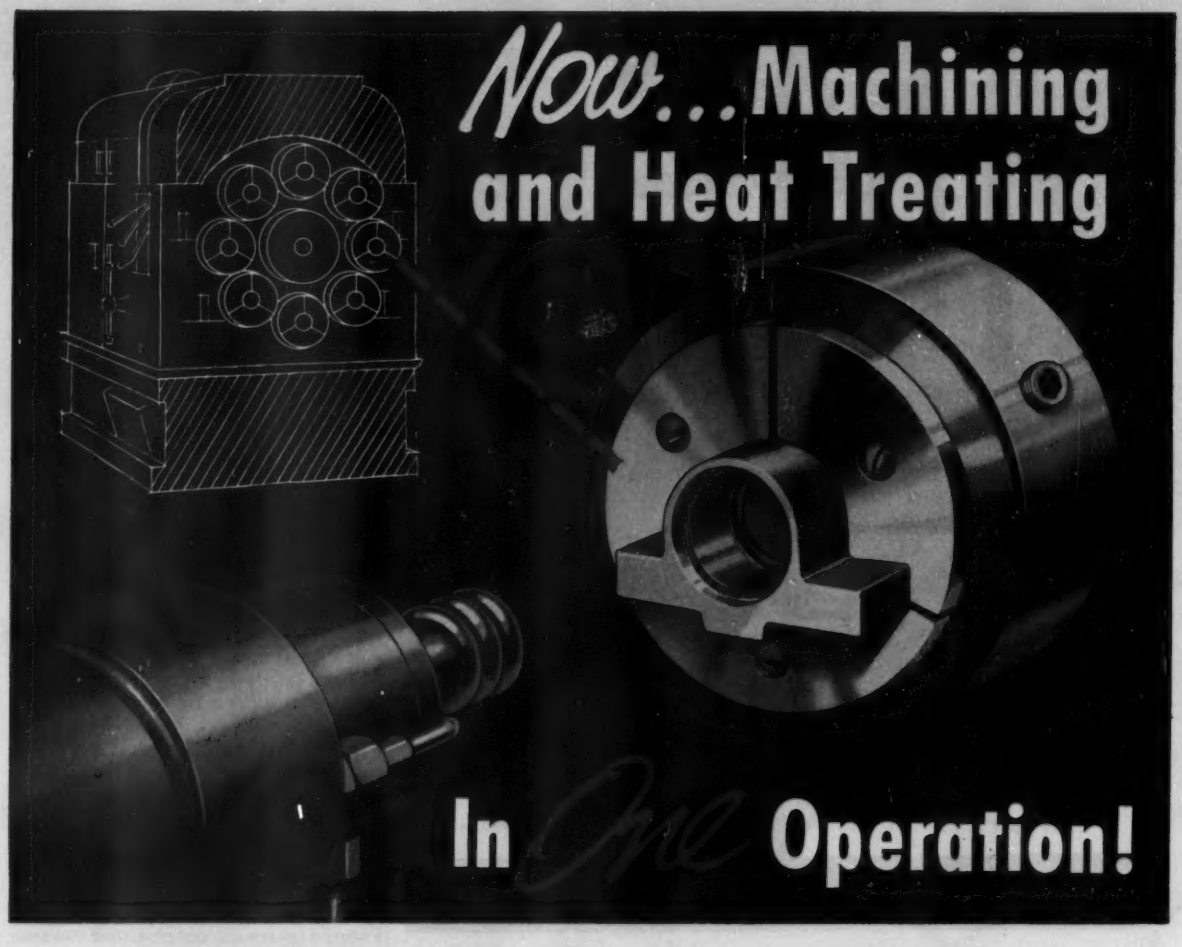
The role of humble observer is very difficult to maintain by the initiator of some brilliant new tool or method, but it is the best attitude if quick and concrete results are to be obtained from a tool try-out or the like.

Actually, if the tool designer has done a thorough job of design and has provided for every possible difficulty which can arise and has communicated his ideas in the form of good drawings, he really need not interfere with the shop in any way. The tools can be issued, placed on the machine, and trials performed without the designer being anywhere in the vicinity.

It is very difficult for the non-unionist to understand the workings of the thorough-going trade-union mind, but it is my experience that threats of union action only arise when some person is aggrieved; then the union is waved like a bludgeon. The simple answer is that grievances should not be fomented in the first place and need not be, if non-unionists will exercise a little tolerance and human understanding and refrain from holding arguments on the shop floor about trade unionism and its shortcomings. The subject should come into the category of religion or politics and should be unmentionable.

Clifford T Bower
London, England

"Hey, where do ya want this thing?"



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Mechanics Universal Joint Division of Borg-Warner Corporation now combines automatic heat-treating and metal-working operations on the same machine!*

A Tocco Inductor Coil, matched to one spindle of a multiple spindle automatic screw machine, heat treats the inside diameter of automotive trunnion cups—after they have been completely formed on the same machine tool. Twenty-two, 20 and 50 kw, 450,000 cycle TOCCOtron Induction Heating units and 44 automatic screw machines (installed here and in other plants) make up this high-speed production team.

This new method permits the use of SAE 1144 steel and eliminates costly, time-consuming copper plating and carburizing operations formerly required. Heating and quenching cycles total approximately 10 seconds per part, and production is in excess of 300 parts per hour from each machine.

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* A patented process

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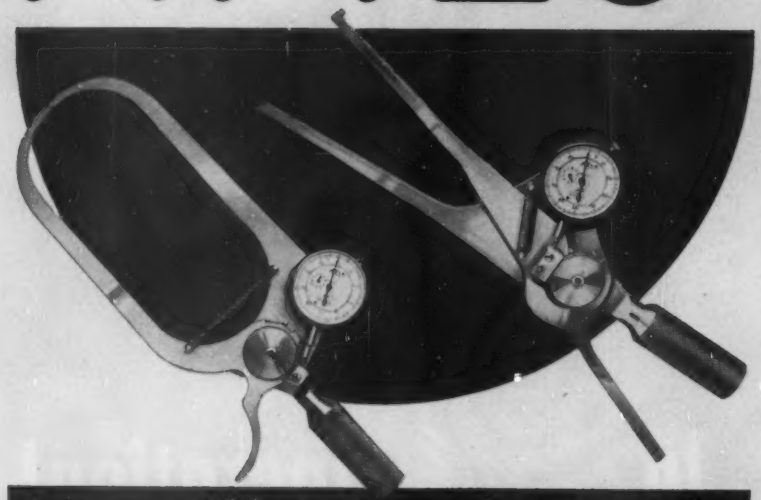
AMES



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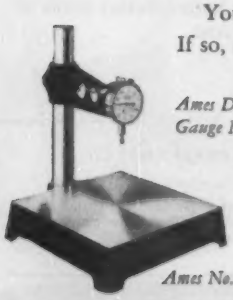

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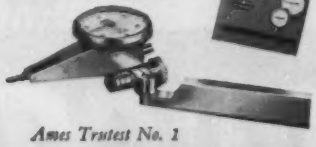

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SUGGESTIONS or EXTRACTIONS?

Should a toolmaker be eligible to participate in a Suggestion Plan, or is it part of his job to produce new ideas and better processes?

THE QUESTION of paying certain individuals such as toolmakers for suggestions about their work is a very old one and is not confined to Ed's shop. Many plants have and are handling the matter successfully through the use of a definite plan with specified channels through which the suggestions travel. Specified methods and techniques have been worked out, and, if followed intelligently, a suggestion system should not prove too troublesome.

In Ed's shop apparently a fundamental error is being exercised continually. I gather the impression that Ed has a large voice in passing on the value of suggestions originating in his department. If so, that practice is wrong, as it violates certain well-known rules.

It is a known fact that many foremen are inherently jealous and bitterly resent any of their employees receiving awards for constructive suggestions. This trait is as basic as hunger, and all good suggestion systems are set up in such a way that this phobia may be circumvented. Locked boxes, inaccessible to the supervisors, are provided for the suggestions. The boxes are visited at stated intervals, opened, and the suggestions removed by a representative of the personnel department or of management.

In the better systems, the suggestions are recorded, graded, and filed. A number is assigned to them. An acknowledgment is sent to the suggestor. The suggestion is retyped, and turned over to a disinterested engi-

"Well it looks like your machine shop business isn't the only thing that's been going to pot lately!"

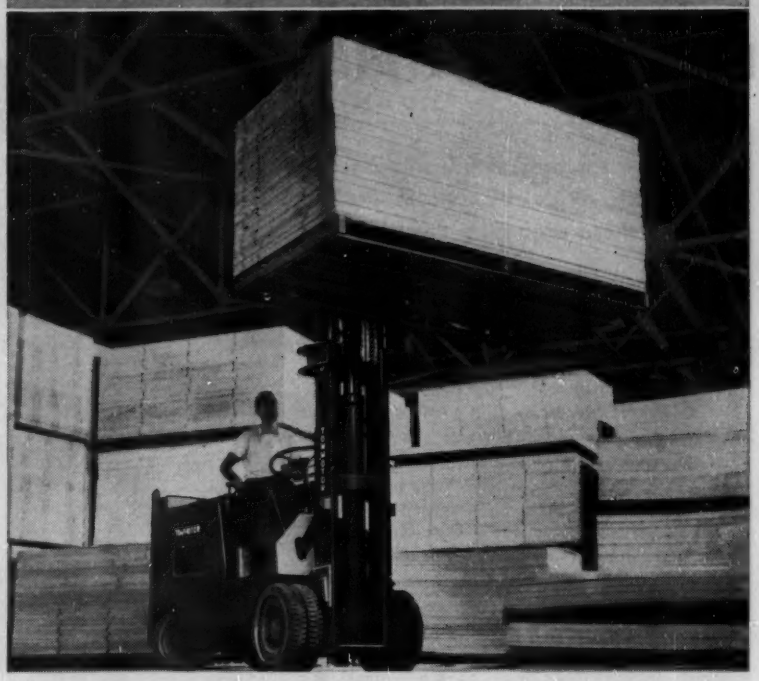
neer to investigate. This engineer does not know whose suggestion he is handling.

As an engineer and as a superintendent, or works manager, I have handled and passed on hundreds of suggestions. Many suggestions are impractical and are made by people who lack the requisite technical information and training to prepare a valuable suggestion on the subject they have selected. I'll cite one example.

At one time I worked as a heating and ventilating engineer for one of Akron's large rubber plants. On the roofs of our plants we had dozens of large and small dust collectors, which were used for diversified purposes, and occupied considerable space. They were definitely unsightly. One of the men turned in a suggestion that we throw out all the collectors and replace them with one large collector. Now to the man, who was not an engineer, this was a real prize idea. Actually the idea is a dud, and would so be recognized by any competent engineer. It is not only technically impractical, but it is dangerous. Who, knowingly, would mix benzine fumes with dry sawdust from a woodworking machine containing that occasional nail which sparks as it whirls through the metal ducts? We have enough fires and explosions now without going out of our way to deliberately cause more. I passed on the validity of this suggestion, rejected it, saw the man, explained to him courteously just why the idea was impractical, and that was that.

On the other hand, there are a small number of good, practical suggestions that come through, and which are eagerly sought after. An instance of that kind occurred in our laboratory a few months back. In our work we have occasion to cut out many samples of rubber up to an inch in thickness, round, and of several diameters. The standard practice is to cut these samples out with a hollow die and a mallet. This method has been in use for years and invariably results in a disk with tapered or necked-in sides. One of our toolmakers put his head to work and designed and made us a set of new precision dies to be used in a drillpress. These dies have tapered cutting edges like the hand punches, but the outside of the dies are knurled. This knurling keeps the die from binding when it is in use, and the knurled surface picks up and retains the lubricant used in cutting. We now cut our samples faster, and we get better samples. This toolmaker turned his idea in as a sug-

LEASE-A-TOWMOTOR



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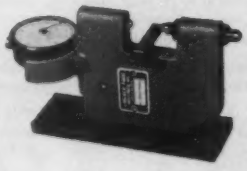
STANDARD GAGE—size range from 0 to 5" (special length gage for crankshaft inspection shown).

RETRACTOR TYPE—for gear or spline checking. Special anvils can be supplied.



SPECIAL BENCH TYPE—with carbide ball anvils, for checking pitch diameters.

BENCH or COMPARATOR TYPE—for checking small parts.

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gestion, and it promptly won an award. We are all agreed that the idea merited an award.

However, that suggestion passed certain definite tests and complied with the requirements for an award. Note:

1. The toolmaker thought that idea up himself; no person proposed it to him or gave him the basic idea.
2. The idea was above and beyond the definite call of duty. The toolmaker had been given the hand punches to sharpen. After sharpening them, he tried them out, and he didn't like the results. He accordingly got busy and created something new and something better.
3. The improvement concerned another department, and was definitely not one that could be logically expected of the man.

There is a definite disinclination on the part of management, and rightly so, to pay anyone a bonus for doing the work that is his basic bread and butter. A designer, working continually on design work, cannot expect to be paid for his creations other than through his normal salary. He is paid to design, and that is his job.

A toolmaker, who is given a set of drawings from which to construct a tool or fixture cannot logically expect a bonus if he improves on the original design slightly. He is expected to do just that. On the other hand, if he invents and creates a method by which all time spent on drawings can be shortened appreciably, by eliminating sectioning, for instance—and turns that in as a suggestion, he can expect an award for his idea.

Or, if he figures out a way in which two pieces can be permanently eliminated from one of his com-

"Every time I got near satisfying their hardness specifications, they came up with some reason for increasing them."

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And that, we believe, is typical of Baird's whole approach to high production machinery and tooling. For years, people have said "ASK BAIRD ABOUT IT" only because they know we will give them the right answer. Send in your inquiries, gentlemen — we're never too busy to help.

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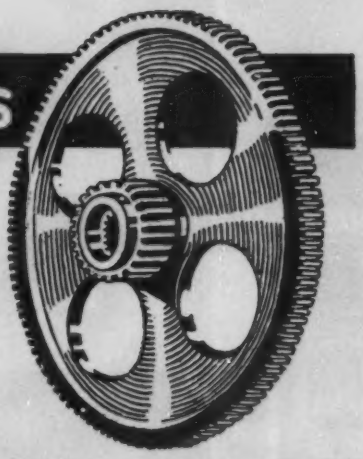

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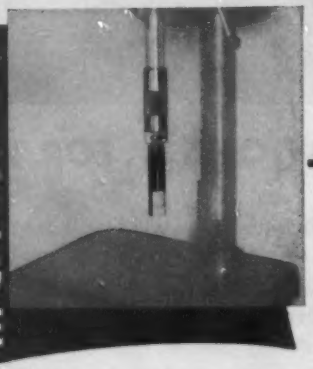

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pany's machines, thereby reducing the cost, that idea would deserve an award. Every case is judged on its own merits, and there are no exact rules that will fit every shop. However, the further an idea is from an employee's own bread-and-butter duties, the better chance it has of being a real winner. The idea definitely must be above and beyond the call of every-day duty; if it doesn't pass that test, then it will not pass any of the other tests.

James K Matter
Detroit, Mich

TO BE REALLY EFFECTIVE, a worthwhile Suggestion Plan should enlist the cooperation of everyone in the plant, not excluding salaried employees. In other words, if any individual dreams up something that will cut costs or improve the quality of the product involved he or she has made a tangible contribution to the worth of the company and should be rewarded in proportion to the value of the suggestion. To limit the suggestion awards to a certain group of employees, as Ed would like to do, is most certainly going to limit the effectiveness of the plan and create a certain amount of ill-feeling, which is directly contrary to the feeling of teamwork that a really live Suggestion Plan should instill.

What Ed is really saying to his toolmakers amounts to this: "You fellows, in addition to possessing the know-how of operating machine tools to fine tolerances, plus a certain amount of trigonometry, plus an acquired experience in making complicated setups to produce tools that will make the production worker produce more efficiently, are expected to go the tool engineer one better as a matter of course, because the

company pays you ten or twenty cents an hour more than the going rate of the man on the production line, who expends more physical effort than you do." Which can be expected to achieve the amount of goodwill that would be generated between Ed and the company if the superintendent came to Ed and said "Ed, the board of directors has been talking things over, and has decided that because you receive $25 a week more than the production foremen, because of your knowledge of toolmaking, they have decided to discontinue paying you the usual quarterly bonus the other foremen get."

The analogy, of course, may be a little far-fetched, but the moral is obvious. The human animal likes to feel that the horizon is unlimited and the rewards are there even though he may lack the ability or the energy to achieve them.

If you exclude certain groups of employees from a suggestion bonus plan, whether they be toolmakers or office workers, you in effect limit their horizon and invite average performance of their duties instead of the better-than-average performance.

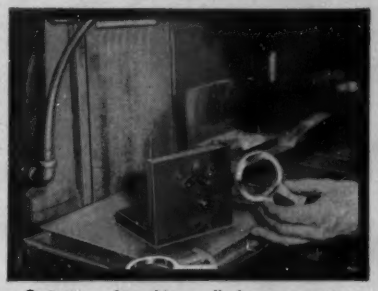
Robert S Alexander
Glastonbury, Conn

WHY SHOULD A TOOLMAKER be singled out as not being entitled to extra pay for giving out ideas to increase the efficiency of a plant? He is earning pretty good money for the work he does, but it should be remembered that he hasn't always enjoyed being paid in accordance with his superior skill and experience. He has sacrificed considerably to arrive at his position and, through the nature of his work, he, of all workers, is able to see where hours and dollars can be saved.

Is developing money-saving ideas a part of his job? Not always. There may be times when he is hired with that end in view, but ordinarily he is hired to perform a job of definite standards. If we fence the fellow in and restrain him by issuing a decree to the effect that because he is a well-paid employee he is not entitled to participate in a Suggestion Plan, then we're killing the goose—and believe me—a dead goose lays no golden eggs.

We cannot get the best out of an employee by coercion, nor can we take away his just privileges. It is the toolmaker's inalienable right to exercise his powers of development. By depriving him of this right the manufacturer is throwing sand in the machinery of progress. Doesn't it seem logical to assume that a man who is qualified to be rated tops in

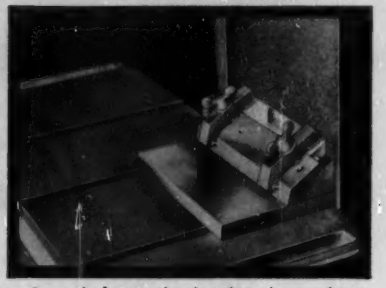
Faster ON THESE JOBS ...than a lathe ...than hand filing ...than a milling machine ...than a surface grinder



● Facing this thin wall bronze casting formerly took 9 min. on *engine lathe* — now takes 2 min. on wet-belt grinder.

● Generating radii on forged aluminum gun mount stepped up to 120 pcs. per hr. — double rate of *filing*.

● Ammunition box rim originally *milled* for close fitting cap at 33 per hr. — now abrasive belt ground at 89 per hr.



● Angle face on hardened steel cutter bar; output by *surface grinder*, 4 per hr. — by abrasive belt method, 14 per hr.

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4. Guaranteed free from decarburization.
5. Available in wide range of sizes.
6. Exceptionally smooth surface finish.

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65 Governor St., Hartford 2, Connecticut

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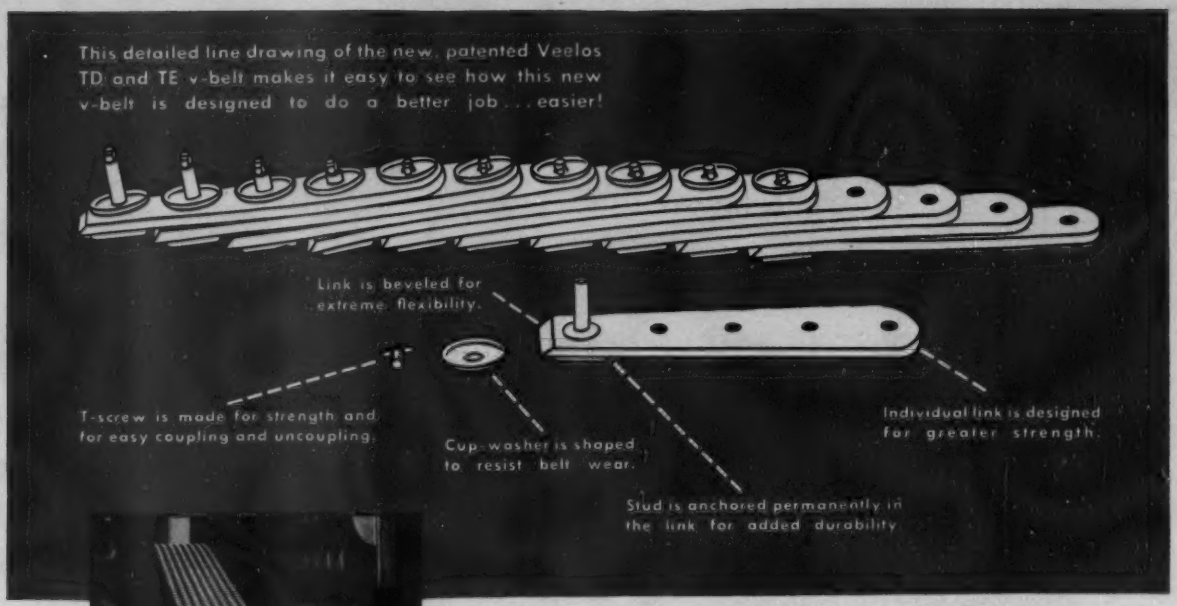
classification should be so rated as to his potentialities? Can we not look upon him as being a qualified piece of equipment ready at all times to be called upon to do a superior piece of work?

Ed fails to realize that the company is drawing dividends from the toolmaker's experience gained at some other plant. Why he takes the attitude he does relative to the man's past is not understandable. The chance is that the toolmaker served his apprenticeship in another shop and is under no obligation at all. In rating a man's worth we cannot assume that he spent all his learning years and acquired all his experience in the one shop. Most of the ideas he expresses are the result of years he has spent somewhere else. So, Mr Eddy, get hold of yourself.

If, as Ed says, the "other men" aren't expected to think up money-saving ideas, why all this hullaballoo about a Suggestion Plan in the first place? Ed, you're nuts to make such a claim.

Here, following, is a case in point which proves beyond a doubt that such a statement is ridiculous: A lowly dispatcher, a man whose job it was to push loaded trucks throughout a small plant, had to make a detour around the stockroom on his route in order to reach a certain location in the plant. Jake was an easy-going person of middle age and to look at him one wouldn't think that he had very much upstairs. Not so! An idea struck him when making the detour that he was being put to unnecessary labor which, in turn, delayed his deliveries to a certain extent. Jake was thinking in terms

"Now easy does it . . . remember this is a rental!"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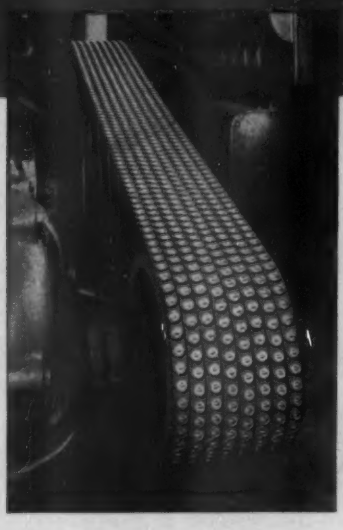

New VEELOS

TD and TE Adjustable V-belt

So easy to couple *it installs in minutes*

So strong and durable *it lasts for years*

The new Veelos TD and TE adjustable v-belt is the successful development of a specific v-belt designed for a specific service—D and E drives.

This new Veelos TD and TE v-belt has these basic advantages . . .

It simplifies installation. Links are quickly joined by easy-to-use cup-washers and T-screws to make up individual belts. It's the easiest v-belt to couple and uncouple ever developed. And you don't need to waste time removing outboard bearings.

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Get the complete story of this great new v-belt for D and E drives. Send coupon now for new 8-page illustrated catalog.

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ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

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Model M-1500

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Manufacturers of LEHIGH Air Valves • Air Cylinders • Air Hoists • Air Motors
West Coast Dist.: CAMPBELL CONTOUR ATTACHMENT CO., 1320 W. Esther St., Long Beach, Cal.

of delivery and wrote up his suggestion thus: "Instead of having to make a jog in my route, why can't we go straight through the stockroom and save time and effort?" Jake foresaw an objection and prepared for it as follows: "To hell with the stockroom; I'm thinking of my job." The result was that an investigation was made and pretty soon a couple of pneumatic hammers were busy knocking holes through the opposite walls of the stockroom.

Jake could have put up with the time-consuming job because he was being paid so much an hour. He could have said, as the idea struck him, "Ah, to hell with it," but he didn't. There was the incentive to make a few extra dollars that stirred up the gray matter which, without the incentive, would have remained rippleless in the cranium sea.

Now if Jake, with his limited horizon, could direct his thinking power toward a means of saving the company money, what a bonfire of ideas could emanate from the brilliant dome of an expert toolmaker, provided he is faced with the privilege of getting some extra do-re-mi.

Harrison Mitchell
Topeka, Kansas

SUGGESTION SYSTEMS have been in use many years and much valuable information has been unearthed through them. Ed's gripe about mechanics being paid for suggestions seems unwarranted.

I remember one place I worked where we had a suggestion system. One of our machinists gave us ideas many times a year. This man could not make a drawing, but came to me with his ideas and I would get them in shape and send them through him.

There have been abuses in the

"It's just to tide me over until the coffee break!"

"The Lowest Bidder

It's unwise to pay too much, but it's worse to pay too little. When you pay too much, you lose a little money—that is all.

When you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do. The common law of business balance prohibits paying a little and getting a lot—it can't be done. If you deal with the lowest bidder, it is well to add something for the risk you run. And if you do that, you will have enough to pay for something better."

John Ruskin

1819-1900

Especially true of Gears

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Installations are simplified and require less bearing space with corresponding savings in machining costs. Housings can be smaller and less complicated for bearings with shaft sizes ranging from ⅜" to 2".

Five different seal combinations provide versatility in handling sealing problems where the proven performance of GUIDEROL bearings can add capacity, dependability and longer life. Using the new complete unit eliminates the bother of separate bearing and seal sources.

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Write today for Bulletin SGR-54 on dimensions, shaft and housing fits and tolerances.

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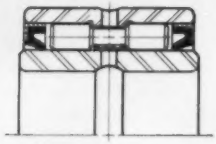
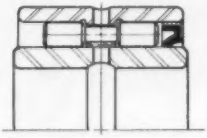
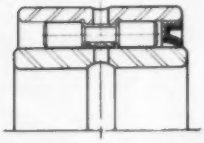
McGILL offers New Sealed GUIDEROL® bearing in 5 seal combinations.



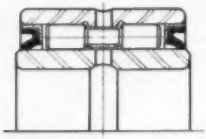
SS—Double seal, lips in. For lifetime retention of lubricant.



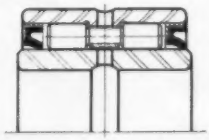
S—Single seal, lip in. Retain lubricant. Usually another sealed bearing at other end of shaft.



RS—Single seal, lip out. Used opposite another bearing to prevent entry of foreign material from one face.



RSS—Double seal, lips out. Prevents entry of foreign materials from both faces.



SRS—Double seal, one lip in, one lip out. For easy relubricating without displacing seal.

McGILL®
precision bearings

method of collecting information, especially through the placing of boxes around the plant. The best method to gather the ideas is to have the employees give the suggestions to the foreman or to a designated official. This will eliminate the stuffing of boxes with nonsense by jokesters.

The very fact that mechanics might have superior knowledge of plant problems is no reason to expect them to divulge their ideas — without compensation — the same as the rest of the employees. The fact that a company withholds participation of their toolmen costs them many valuable ideas.

The reason why some companies do not fare well with suggestions is the fact that they are too niggardly with compensation. In the plant of the United Aircraft Corp of East Hartford and the Hamilton Propeller Corp of Windsor, Conn, awards run into thousands of dollars in many cases.

There is another angle to the suggestion idea, and that is, the men who make the best and most suggestions might be men that management is looking for for promotions. This should be stressed in the literature of the system.

The only exception to participation should be the foremen, engineers, and officials of the company who are being paid for just such work.

Wm C Betz
New Britain, Conn

ANY SUGGESTION plan should include all the workers. It is important that all employees be a part of it, contribute to it, and desire it. Toolmakers should be included in it because it is the right thing to do for both the employee and the company.

How the plan is run will influence the individual and can be a part of making the employee either feel good or bitter against the company. The plan should be easily understandable and made known to all the workers. Every individual who presents an idea should be treated with understanding and appreciation. Every suggestion should be acknowledged. If the suggestion is rejected, send the employee a letter of thanks and ask him to try again. If it takes time to search out the idea or its possibilities, send a letter of progress. Do everything possible to personalize the system, to eliminate the formality and make it human.

Any plan that excluded the toolmakers would cause resentment and discord. A toolmaker makes dies, jigs, and fixtures of all types. He

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Cam and levers designed for greater jaw travel, powerful gripping and highest safety factor.
Double ways for master jaws maintain precision, help prevent bell-mouthing.
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Famous S-P cam and lever design holds the work tighter, permits cost-cutting heavy feeds and multiple cuts. Cam and lever design also resists opening of jaws by centrifugal force or diminishing air pressure . . . an important safety factor.
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Automatically!

Demands by the automotive and steel fabricating industries have promoted the design of larger and faster presses. Satisfying the maximum capacities of these presses presents a problem in "Automatic" feeding. After all, there is no sense in designing more speed and capacity into a press unless it can be used to advantage.

Press builders and users both turned to "McKay," long a leading designer of "Automated" machinery, for a solution to their feeding problems.

McKay engineers came up with the answer with an "Automatic Press Feed Line" which includes: coil preparation, also cleaning, processing, leveling and feeding the strip in perfect condition at hitherto unheard of production speeds. THAT'S WHY **TODAY** THE TREND IS TOWARD **McKAY.**

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Other "Automated Equipment" built by McKay includes Strip Cut-up Lines, Bar and Tube Draw Bench Lines — Cold Roll Forming and Cut to Length Lines, Electric Weld Tube Mill Lines — Tube Cut-up Lines.

Consult with McKay engineers when you have a special "Automation" problem.

The **McKAY MACHINE** *Company*
YOUNGSTOWN, OHIO

McK

ENGINEERS AND DESIGNERS OF EQUIPMENT FOR THE AUTOMOTIVE, FABRICATING AND STEEL INDUSTRIES

usually works from blueprints. Sometimes the toolroom foreman gives him a sketch to work by. If it is some simple part, he tells the toolmaker what he wants and the toolmaker uses his own method to accomplish it. The rules should be made clear in any suggestion plan regarding what is and what isn't a new idea. A committee is carefully chosen from the various departments to decide if the idea is practical.

Most all companies sell their product by good salesmanship and advertisement. In a suggestion plan the idea must be sold to the employee. It must be talked about and publicized. This makes it easier to sell the plan to the employees. The suggestion plan can only be successful when every worker is a part of it and when the company takes the time to make it a constant selling job.

A E Salmons
Philadelphia, Pa

ED IS RIGHT ABOUT the necessity of drawing a definite line between regular responsibility and extra effort. However he has the line in the wrong place if he thinks toolmakers are not entitled to receive a bonus for ideas submitted via the suggestion system. The whole idea behind the suggestion system is to provide an incentive to the employees to get them to dig out those extra ideas and to write them out and submit them.

In our organization every employee on every level is permitted to submit suggestions. All those on the level of supervisor and above are not eligible for cash awards, but the value of the suggestion is entered on their permanent company record. There is positively no reason for ex-

"I wish maintenance would change it to a left shoe pedal . . . I have ten of 'em at home!"

Cuts Metal 15 Times Faster than Hand Hack Saw!

NEW . . . Porter-Cable Portable Band Saw Only **$215.00**

Slices through 1½" cold rolled steel in 41 seconds! That's fifteen times faster than a good man with a hack saw . . . *two-and-a-half times faster* than bulky power hack saws!

You can use this 16-pound work-demon anywhere—on ferrous or non-ferrous metals or "problem" materials. Take it into equipment yards, stock bins . . . tight spots where costly hand sawing is the only other answer. Use it for general maintenance, teardowns. Compact, easy to handle, Porta-Band delivers smooth controlled sawing in any position. Only the cutting part of the blade is exposed. Cutting action pulls the blade snugly into cut, holding saw firmly in place.

Powered for heavy duty . . . perfectly balanced . . . Porta-Band handles the toughest assignments. Band speed of 240 feet per minute insures swift, smooth cutting of all materials up to 3¼" diameter round, or 3¼" x 4¼" rectangular. Highest grade precision ball and needle bearing throughout. Aluminum alloy frame for lightness, toughness. Universal 115V AC-DC, 25-60 cycle motor (230V available at extra cost).

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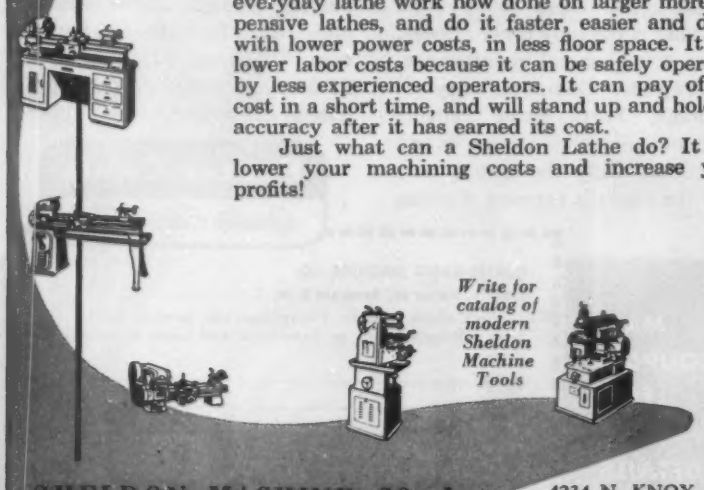
Just what *can* a SHELDON Lathe do?

A 10", 11" or 12" Sheldon Precision Lathe can work to the closest tolerances and hold its accuracy because it has "Zero Precision" Tapered Roller Bearings. It can operate at a wide range of speeds, has an efficient underneath drive (4 speeds open belt, 4 speeds through back gears). Its double V-belts to the spindle will deliver enough sustained power to take really heavy cuts with high speed "open belt" operation. It will cut from 4 to 224 threads per inch with the shift of two tumblers on its full quick change gear box (54 different pitches including 27 t.p.i.). It will provide big lathe collet capacity—a 1⅝" hole through the spindle.

A Sheldon Precision Lathe will do most of the everyday lathe work now done on larger more expensive lathes, and do it faster, easier and do it with lower power costs, in less floor space. It can lower labor costs because it can be safely operated by less experienced operators. It can pay off its cost in a short time, and will stand up and hold its accuracy after it has earned its cost.

Just what can a Sheldon Lathe do? It can lower your machining costs and increase your profits!



Write for catalog of modern Sheldon Machine Tools

SHELDON MACHINE CO., INC. 4234 N. KNOX AVE. CHICAGO 41, ILLINOIS

cluding toolmakers. After all, there are a great many fields within an organization where suggestions for improvements can be made; tooling is just one phase of the picture.

Our organization goes all-out to get suggestions from all departments and as a thought-starter tells the employees just what kind of ideas are wanted. We ask for ideas on "anything constructive" and then give a brief list of subjects, but point out that suggestions in other fields are also welcome. The list is as follows: Safety—eliminating hazards; Savings—labor, materials, and supplies; Improving—tools, machinery, materials handling, methods, or our products.

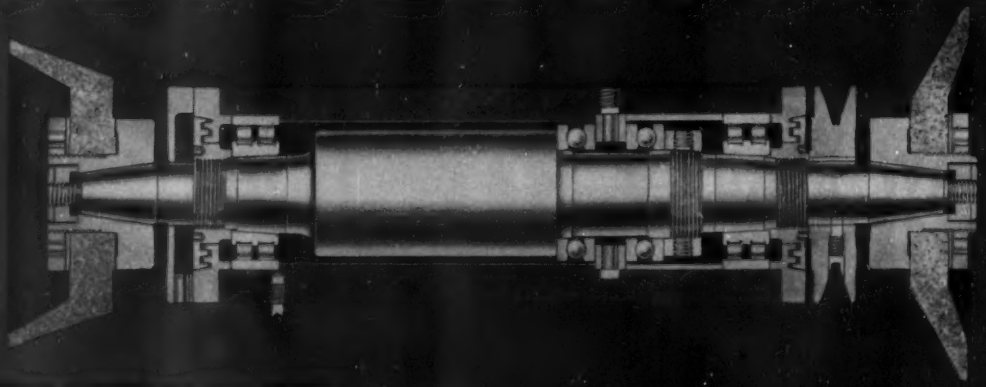
With such a list before them how could anyone single out the toolmakers and say "No bonus for suggestions from toolmakers." What if a toolmaker makes a suggestion for improving safety on the loading platform, or for materials handling in the stock room? If a toolmaker is not entitled to a bonus for a suggestion on tooling, then the shipping clerk is not entitled to a bonus for a suggestion for handling material in the shipping room. Why be so small and take such a narrow view? Be realistic about it. Whether or not a toolmaker is expected to make suggestions on improvements in tools as part of his job is of no importance. If he is rewarded for it, he will make many more suggestions and be happier about the whole thing, and the company will reap the benefits. After all, the company only pays for suggestions which pay off to the company.

There is another angle to this matter. If no bonus is paid, the toolmakers will not write out and submit their suggestion formally and there are many situations where an informal suggestion does not receive all the consideration that it deserves. This results in employee dissatisfaction. At least with a formal suggestion system the employee feels that he is given fair treatment.

Henry Gifford
Bronx, NY

"I had it made to the same prescription as my eye glasses."

AFTER
8,760,000,000
REVOLUTIONS



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TRIMS METAL CUTTING COSTS

Working with a wide variety of hack saw and band saw machines in this testing laboratory, MILFORD Specialists run exhaustive cutting tests on practically every metal and non-metallic material used in industry. The valuable, practical knowledge gained from these tests not only contributes materially to the improvement of MILFORD Blades as compared to all competitive blades, but also enables us to make valid cutting recommendations to saw blade users. But, in the final analysis, the proof of product superiority is found only by use in your plant with your materials and equipment. Your nearby MILFORD Distributor is ready to arrange a demonstration for you. Contact him, or write to the factory. Learn why MILFORD hack and band saw blades cut metal with consistent speed, accuracy and economy.

THE HENRY G. THOMPSON & SON CO.
Saw Blade Specialists for Over 75 Years
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Profile Blades and Band Saw Blades, Hand and Power Hack Saw Blades

THE HENRY G. THOMPSON & SON CO., NEW HAVEN 5, CONN.

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PRIMA DONNA

What is the most effective way to handle the "special case" worker who considers himself above performing routine work because he has proven his ability to handle the tough setup jobs?

LET US consider an imaginary case to show how a first-class toolmaker might feel on the job. Our man has ten to fifteen years' experience on everything from plastic mold-making to progressive dies, covers a lot of ground. He's handled some pretty tough jobs, and commands a top hourly rate. Being accustomed to doing work which presents a challenge to him, anything ordinary, comparable to "roughing out," is obviously dull and uninteresting. Mental stimulation is lacking. Anything commonplace that can be done by lower labor-grade machinist help he feels is a waste of his time. He just doesn't care to do this work, and when he has to, starts looking around for new fields to conquer. If the foreman can't give him his type of work, he should at least not be too surprised to see his man coasting along.

Of course, it takes all kinds to make the world. Some people can manage to make even the most miserable work interesting.

But what should the foreman do with this type? Well, no man is indispensable. In these days when more efficiency is the order of the day, we would expect to see the prima donna kept busy, in spite of his feelings. As he commands top rates, he has got to remember he is paid every hour of the forty in the work-week, not just when he is doing the tough jobs.

Edward Diskavich
Torrington, Conn

"They're turning out male and female flanges."

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

The parts are all made and on their way. Now I can go on my vacation thanks to you Pete and your favorite Columbia ATMODIE.

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Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

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A PENNY SAVED IS PROFIT EARNED

WITH YOUR

RUTHMAN GUSHER COOLANT PUMP

Low in initial cost, efficient in operation, you can depend on your Gusher Coolant Pump for *economical* operation.

1—They use less power when throttled and require no packing or priming.

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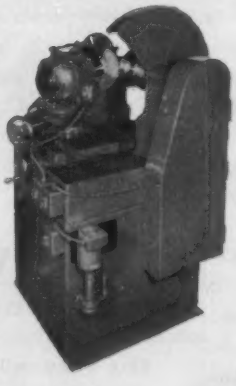
For economical, efficient, long lived Coolant Pumps always specify Ruthman Gusher Coolant Pumps.



Illustrated is a CC-4S Rogers Circular Knife grinder equipped with a Gusher Coolant Pump.

THE RUTHMAN MACHINERY CO.

1818 READING ROAD CINCINNATI, OHIO

IT IS BAD FOR THE MORALE of the department to have a man sitting on his fanny watching everybody else work. He, like the others, accepted a position to work a certain amount of hours for a specified salary. If a man gets paid for forty hours a week that's the hours he should work.

I am quite sure sufficient tough work could be found for a man of his capabilities. If he makes his own fixtures, he can probably also make his own tools. For each tool he can make a spare. This should keep him busy.

I have never yet seen a good toolmaker who sat on his behind a couple of days a week. A good toolmaker takes pride in his work. I cannot picture a man sitting around in this day and age. To me this would be very monotonous. An employee should work the hours he is paid for both mentally and physically. If he is not doing so, he is not producing. No employee is good enough to be allowed to affect the morale of the rest of the department. In his spare time he could check quality, resharpen tools, and lay out the jobs going into production.

It is the supervisor's job to see that each man is kept busy. I see no reason to molly-coddle this man even though he is very capable on the job he is doing. It is not fair to the other employees to have one among them who works only when he feels like it. If handled with tact, I think this employee would be willing to work on the less important jobs; a good supervisor could convince him they are important. Another suggestion is to give him a title. A title would make him see that all jobs are important. They may be the trouble; he may not be doing the kind of job in line with his capabilities.

A E Salmons
Philadelphia, Pa

"Of course you can have more money — who's offering it to you!"

HARTFORD *Special*

UNIVERSAL DRILLING MACHINE

- *Fully Automatic*
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This design provides a basic machine employing standardized component assemblies with utmost versatility. It enables the user to create his own single purpose machine to keep pace with engineering changes and obsolescence of parts. Yet it requires only one original investment.

QUICK SPECS:

1. Handles 8" to 60" diameter bolt circles.
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5. Has ½" capacity in stainless steel.
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C-1

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JOHNSON BRONZE CO., 515 South Mill St., New Castle, Pa.

THIS PROBLEM OF the so-called prima donna is a rather unusual one. We have been faced with it on only one occasion that I can recall. However rare or common, a problem is a problem, and even if it is only one man it can be costly to an organization until it has been solved.

We decided that this problem is basically a psychological one. This fellow will at all costs make every effort to occupy a position where he is regarded as an important and indispensable person. In between the tough setup jobs he has two alternatives: he can do the regular simple jobs, or he can remain idle. If he does the simple setup work he will be putting himself in the position of the ordinary, replacable setup man. If he remains idle, he will be making it evident to all that he is a specialist held in reserve for those situations which demand the utmost in skill and ability. These periods of "waiting for the emergency call" are food for his ego and he lives for them. He actually rushes through each setup so he can promptly return to his usual position where his idleness sets him apart from the others. Actually itis distasteful to him to have the waiting time between jobs referred to as idleness. He would prefer to regard it in the same light as the time a fireman spends in the fire house, namely being held in readiness for the emergency.

Should we make an effort to have him work full-time on setup work? This we cannot do, for we would, in his mind, be demoting him and he would lose interest in exerting himself on the tough setups and might even quit. Nobody denies that he is very valuable to the company, but it is still tough on the morale.

The problem resolves itself to this: for the sake of the shop morale we

"Come on, Eustace, and stop sulking. . . . Just because the Boss gave you a little lecture . . ."

LOOK CLOSELY AT THIS PICTURE
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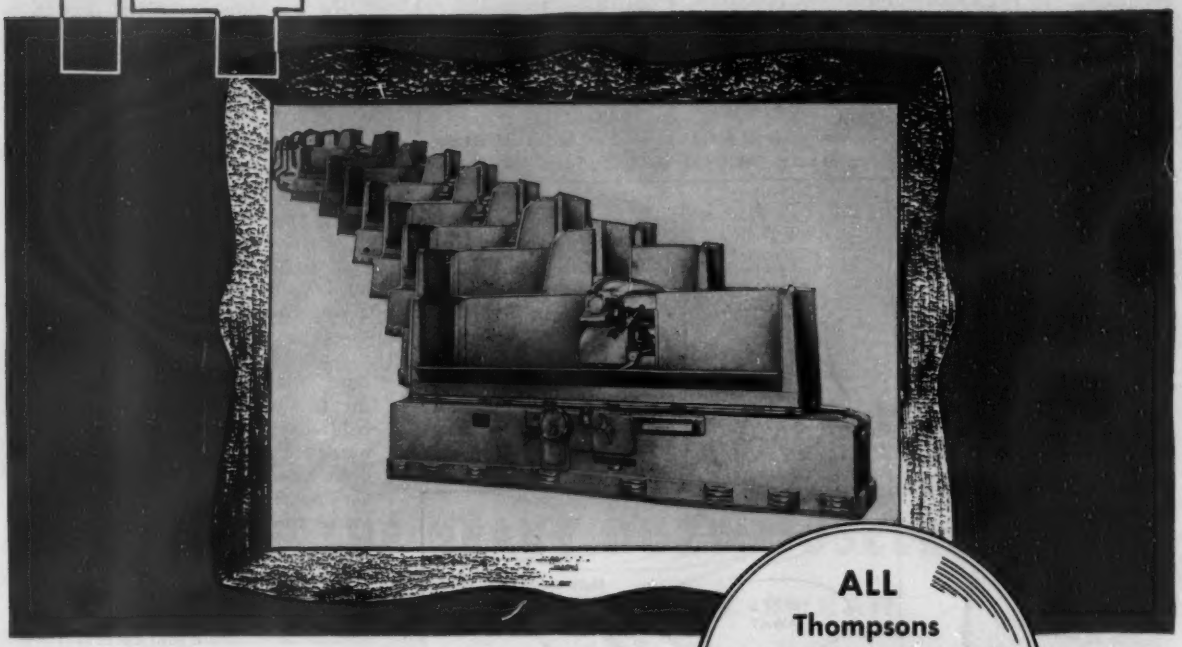

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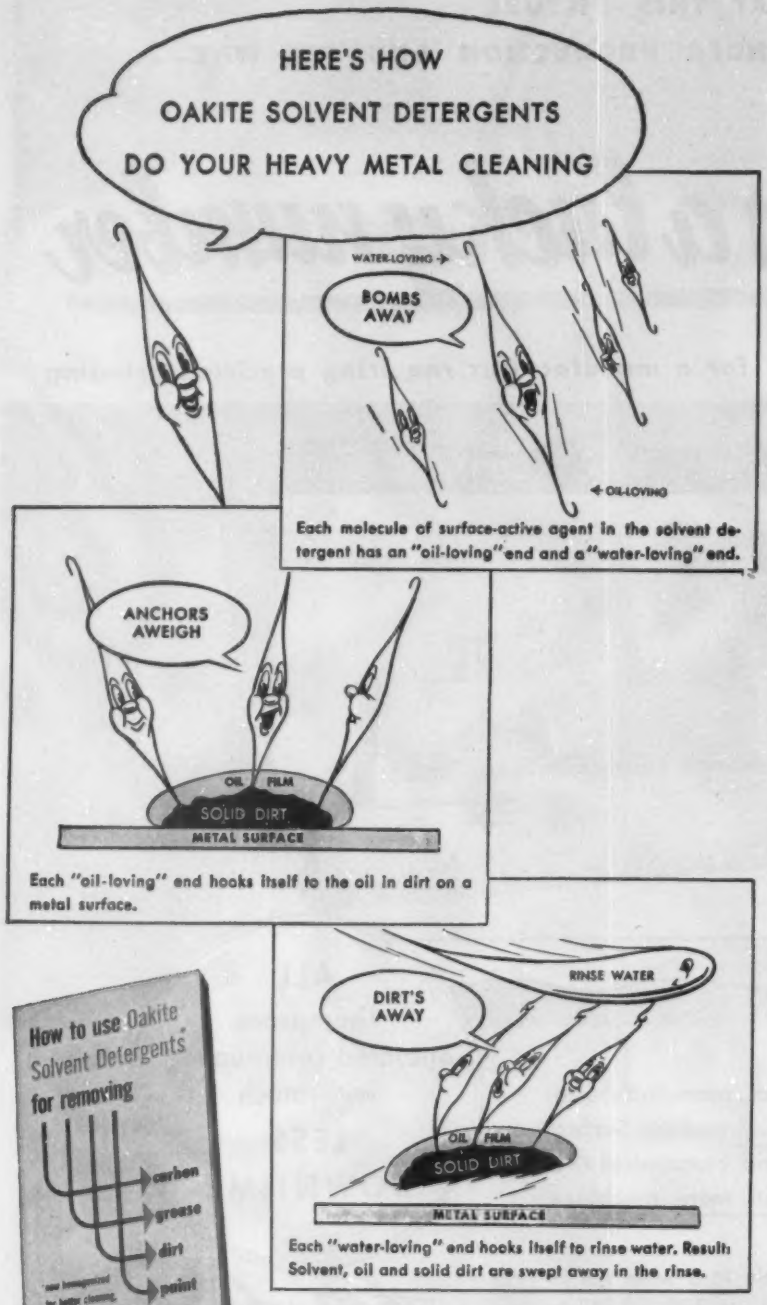
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Each molecule of surface-active agent in the solvent detergent has an "oil-loving" end and a "water-loving" end.
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OIL FILM
SOLID DIRT
METAL SURFACE
Each "oil-loving" end hooks itself to the oil in dirt on a metal surface.
DIRT'S AWAY
RINSE WATER
OIL FILM
SOLID DIRT
METAL SURFACE
Each "water-loving" end hooks itself to rinse water. Result: Solvent, oil and solid dirt are swept away in the rinse.

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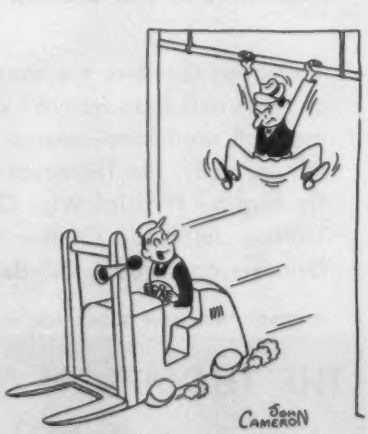
of authority from management if he has to give special consideration to some employees in assignment of work.

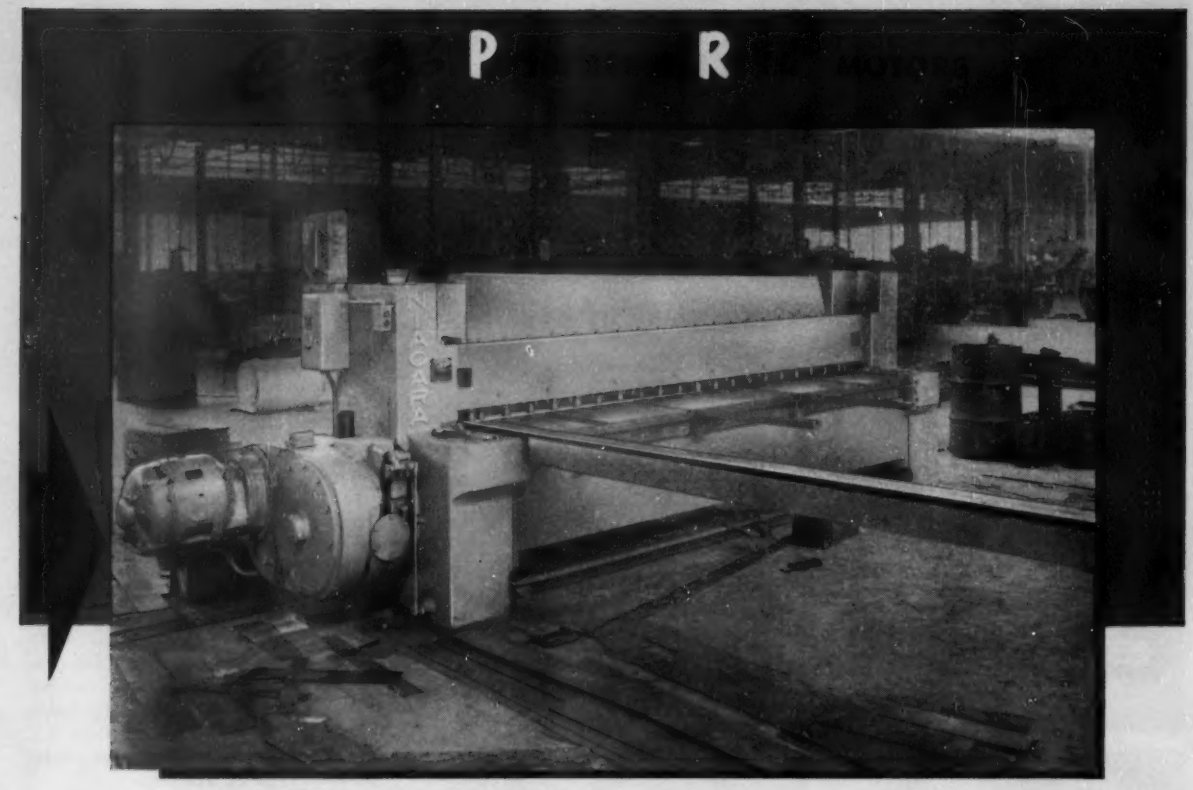
However, the worker's unwillingness to do routine work is subject to change. It's clearly a case of having the foreman use his persuasive ability as a leader to resolve the worker's aversion to ordinary production jobs. The worker, in this instance, being a valuable man with experience and imagination, can be made to see the light if the case is presented to him tactfully and forcefully by the foreman.

No one knows better than the foreman concerned that a man of Stone's caliber should be retained by the company since he demonstrated his affinity for tough setup jobs. It's unfortunate that he makes it a point of declining regular work. For the man's sake as well as the company's the foreman should use all the means at his command to salvage the efforts of the prima donna toward the end of adjusting his duties in conformance with a pattern that will assure a smooth flow of production in the shop.

No one knows better than the foreman how self-centered many indivduals are. Their inner selves live behind sealed doors. It is sometimes hard for them to come out in the open and face the real reason why they act the way they do. The experienced foreman in dealing with the prima donna type of worker should attempt to draw the man out and learn just why he dislikes routine work and seeks to avoid it. I believe that calm criticism and careful direction by the foreman can do the trick in making a star performer into a regular member of the team; one who will not be adverse to accepting any type of work assigned him by his supervisor. The wise foreman knows



"Some horn, eh, boss?"



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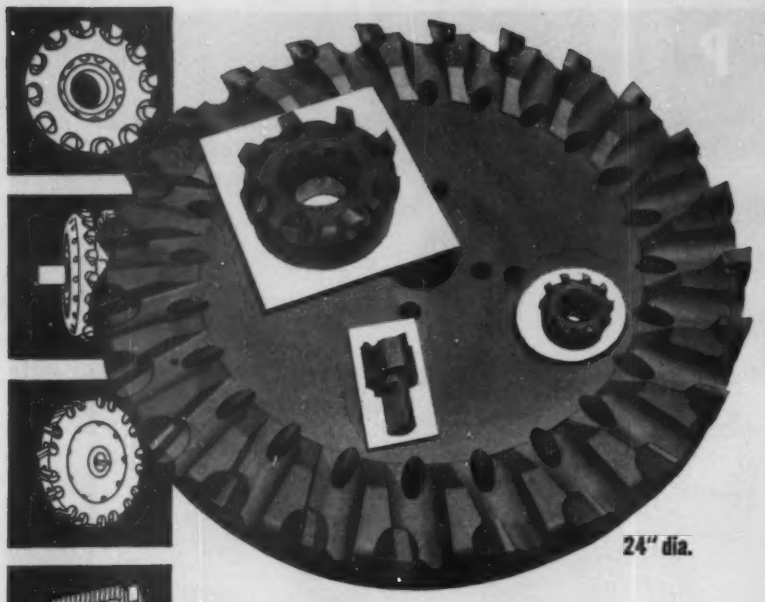

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TOOL COMPANY, INC.

must give this fellow an assignment which will keep him busy; for the sake of the company we must have him available for the special setups. The assignment that we give him must be of such a nature that it will set him apart from the others and give him the all-important feeling of being virtually necessary to the organization.

We found a good solution to this problem. We made him an instructor as well as a setup man. New men coming into the department are assigned to him for all the basic instruction in setup work. This fellow, who was formerly a real problem because of his plus value to the company as a setup man and his minus value as a morale depresser, has become a full-time asset. He takes real pride in his position as an instructor and demonstrates great patience combined with enduring enthusiasm.

William Martin
Brooklyn, NY

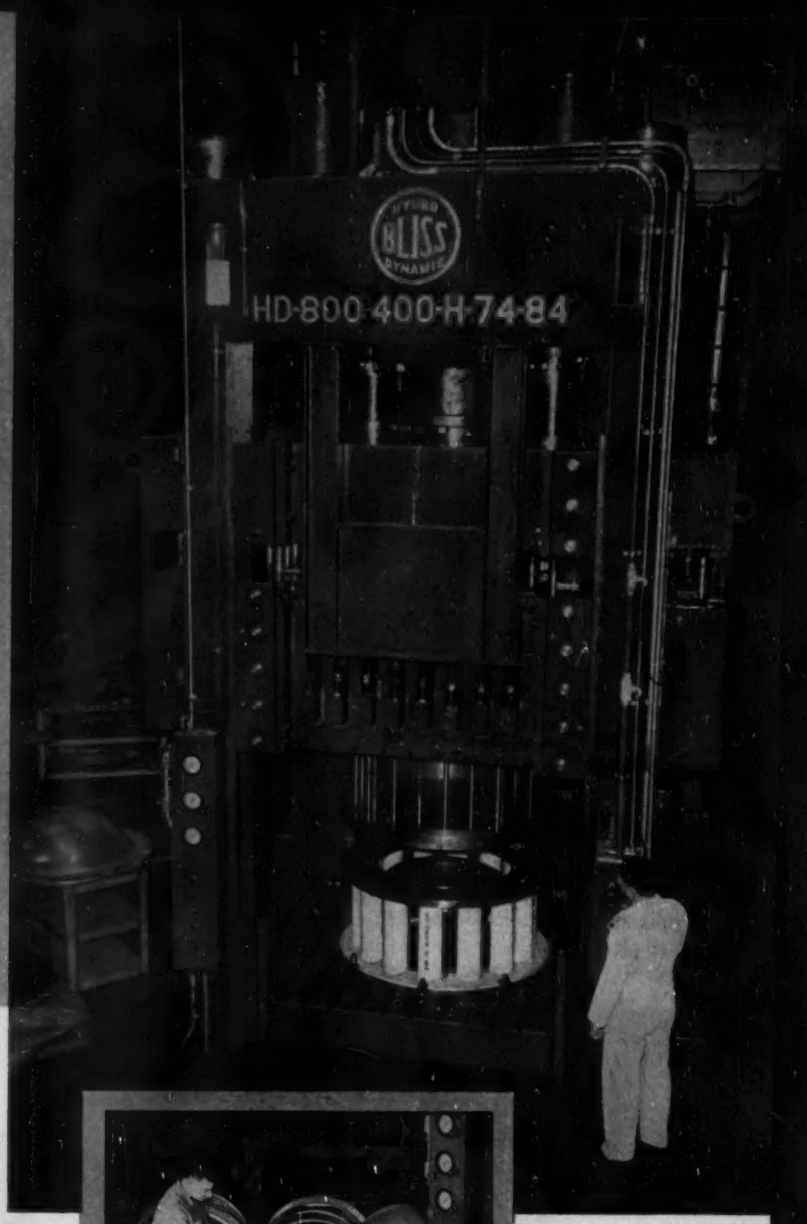
THERE IS ONLY ONE PLACE for the "prima donna" and that is on the operatic stage. Unquestionably, there should be no room in the plant for the egotistical, uncooperative, self-centered type of worker.

Today's competitive conditions make it almost mandatory that efficiency in production exist in the plant. Prima donnas are not conducive to efficiency. Where the foreman is faced with a tempermental star performer of the type that's hot on tough jobs and who sneers at ordinary work, he owes it to himself and the company to resolve the problem without delay, especially where there aren't enough tough jobs to keep the man working continuously. In order to meet production schedules, "special case" employees should not be tolerated. The foreman's job is to get work done through effective manpower management. He cannot efficiently accomplish this delegation

"Care to BUY a cigar, Fred? My wife just had triplets."

DOUGLAS AIRCRAFT LICKS A TOUGH ONE . . .

uses 800-400-ton Bliss Hydro-Dynamic Press to cut reject rate by 68%



FACED with a better than 70% reject rate on 52-in. diameter aluminum shells, a west coast sub-contractor almost sunk the project and himself in the bargain.

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Rejects were cut to less than 2%

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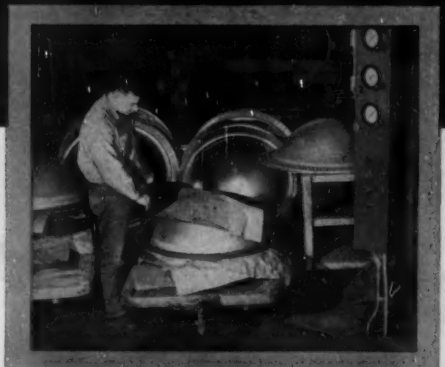

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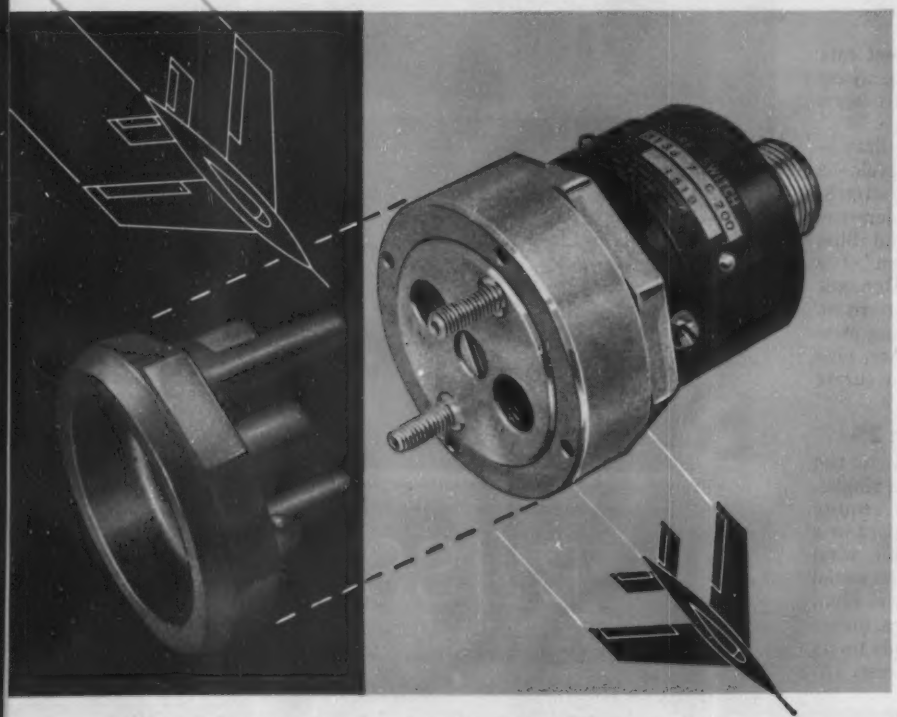

MUELLER BRASS CO.

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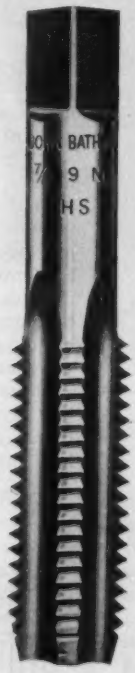
that each worker is different, and gives the foreman a different problem. The same man is different on different days or even at different hours of the same day. Some will work in one group but will not fit in another. They come to the shop with all their needs and desires, all their likes and dislikes, all their independence and group spirit, and all the good points and faults. It's up to the foreman to fit them into the production team to suit the needs of efficient shop operation.

Getting the prima donna to do the things required of him, and to accept the request of his foreman, is a matter of selling the man on the advantages of cooperation, both to the company and himself. Persuading workers gets better results than coddling them, and letting them go their own way. However, the foreman should be more interested in what he can persuade a man to do for himself than in what he can do for the man.

Of course some workers are not cut out to do certain jobs. They are too fast or too slow, know it all or do not know enough. Sometimes a foreman keeps a man on one type of work too long. He is not given a chance to learn other jobs in the department, and when the special type of work goes down, he feels it is a come-down to do some routine work involving much lesser skills. The foreman can help to correct this condition by moving such workers, whenever possible, to different jobs requiring exercise of fair skills, so that the workers can be prepared to do jobs other than their own, but still not of an unskilled or menial type.

Variety is more palatable than routine work. Workers should be trained to do as many different jobs as possible. This skill and knowledge gained by engagement in a variety of jobs in the plant will make the worker more valuable to the company and insure his retention at a

Control



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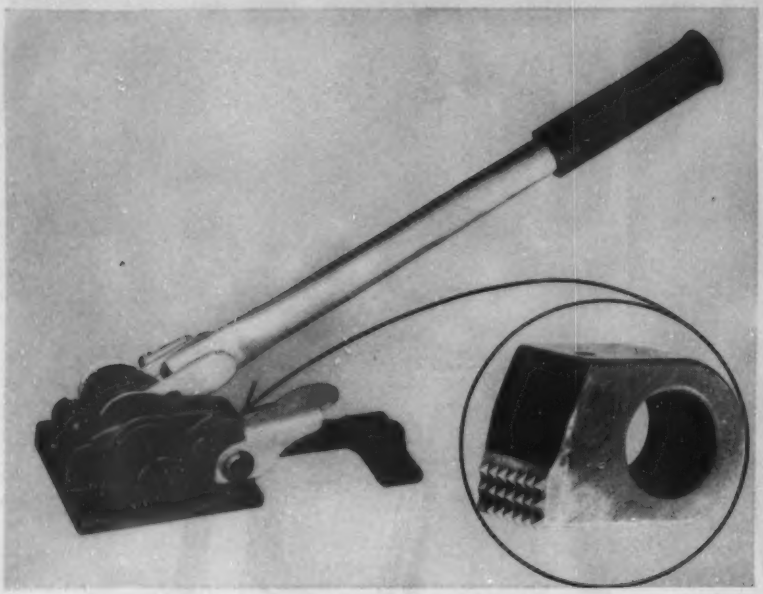

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time when it may be necessary to reduce the working force.

Although we have a man who shows special proficiency in screw machine work and how to set up odd jobs, he should not be allowed to write his own ticket in determining what he wants to do in the shop. If he has all the makings of a good toolmaker, and if it is to the best interests of the company that he work in the toolroom, the man's personal desire to stay in the production shop should not prevail. If workers' desires are permitted to guide operation of a shop, contrary to established arrangement, a state of near-chaos might well result.

In my opinion, there would be no established prima donna in the shop if the foreman had exercised proper disciplinary action in the first place and nipped the budding star performer when he first showed his hand.

However, firing a man because he is a discipline case, due to his refusal to perform certain work requested by his foreman, is not the best way to meet the situation, especially if the man's experience and skill could be used on other work by the company. Unfortunately, there has been too frequent acceptance, and with mediocre results, of the familiar misconception of discipline, stupidly expressed by the martinet's, "I may not be able to make you do it, but I certainly can make you awfully sorry you didn't." For if the man's morale was excellent and he was well disciplined, he would want to do whatever he was called upon to do. Unusual results are obtained by concentrating the effort on developing this desire to perform, and it is the purpose of discipline and morale-building to accomplish just that development.

Stone is a typical egotist. An egotist says: "Nothing is more to me than myself." It is this type of thinking that distinguishes the prima

"I turned it 1 in. and drilled it 1 in. — there's nothing there!"

NEW

OPPOSED-CYLINDER

BALANCED DESIGN, TYPE PHE

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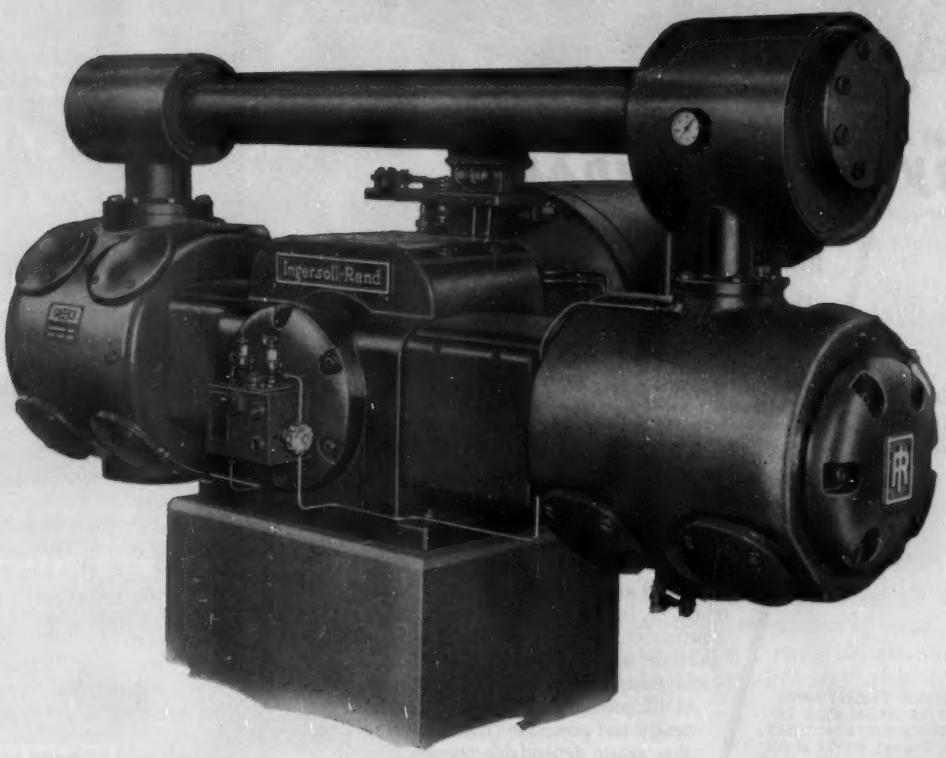

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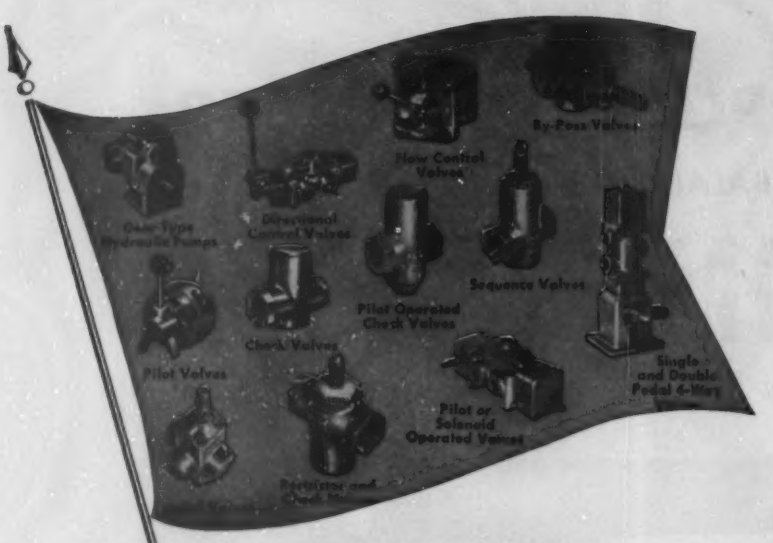

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donna and results in flouting of authority as a compensatory mechanism for a mistaken slighting of self-esteem. His edification at the discomforture of his foreman only inflates his ego.

No matter what the foreman thinks about the worth of the prima donna for special jobs, it is bad practice to have a skilled man sitting around doing nothing, waiting for a special job to come along. "Special case" employees are not conducive to the morale of the group. No matter what Ed believes, Al should put his idea into action to settle the Stone case. Ed can theorize until the cows come home, but without substantiating action the theories remain loud and hollow noises. Sooner or later, the prima donna situation will blow up into a problem for the personnel department, because such situations have a bad habit of involving other employees in a group who are not permitted to sit around waiting for a particular kind of work to turn up.

We are dealing in this discussion with a man who is obviously above the average, but whose special talents cannot be utilized continuously in the course of his employment because of the irregular availability of the special jobs. If he refuses to accept routine regular work in the interim between special jobs, the company may find it advisable to set him up as an instructor for new men, or take steps to have him transferred to the toolroom where his special talents could be utilized continuously. In any event, disciplinary action leading to discharge should be the final action taken.

Since the prima donna worker does possess a great deal of ability in setting up jobs requiring special talent and workmanship, it would pay management to make some arrangements to keep that talent working for the company. In order to avoid frustration of the instinct of workmanship among employees it is important not only that opportunity be afforded to the greatest possible extent for workers to satisfy the desire by placing them in jobs commensurate with their ability, but that their abilities also be developed to the same end. Careful placement is essential for job satisfaction in order that highly-trained persons not be put on tasks which require only a fraction of their skill. Apparently, Stone unknowingly took a page out of Socrates' philosphy which holds that: "He is not only idle who does nothing, but he is idle who might be better employed."

Harry Kaufman
Philadelphia, Pa

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Metal: AMS 6415 Steel heat treated to Rockwell C-35-40

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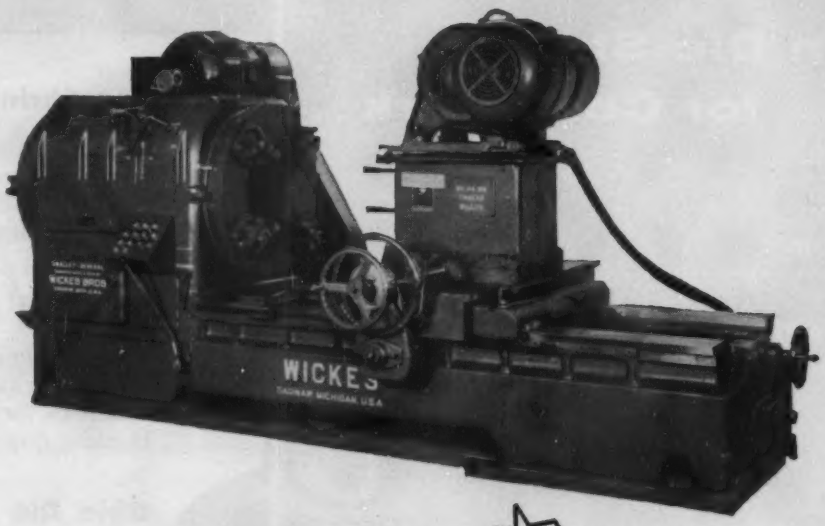
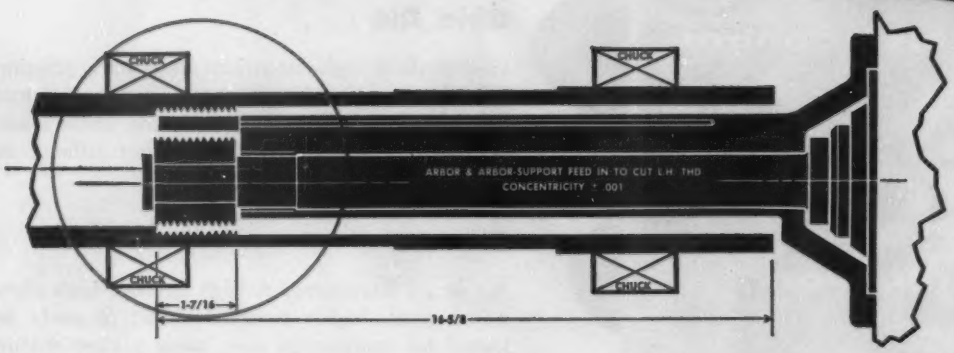
P. D. 5.2719 — 5.2785

Thread milling cutter speed:
70 F.P.M.

Work feed: 5 inches per minute

Milling cycle: 5.9 minutes @ 100%





Available WICKES Smalley General Machines:

Size:	#18	#30	#44
Weight:	14,000 lbs.	23,000 lbs.	29,000 lbs.
Capacity:	8¼" hole thru spindle	17" hole thru spindle	18½" hole thru spindle

Send for latest bulletin on any of these machines.

100 YEARS' EXPERIENCE IN SOLVING PRODUCTION PROBLEMS

WICKES BROTHERS · SAGINAW, MICHIGAN

DIVISION OF THE WICKES CORPORATION

83

New Books . . .

THE DICTIONARY OF BUSINESS AND INDUSTRY—*Edited by Robert J Schwartz. Published by B C Forbes & Sons Publishing Co, Inc, 80 Fifth Ave, New York 11, NY. 561 pages. Price $7.95; with thumb index, $8.95*

This collection of 45,000 technical, business, and legal terms with brief definitions should provide a useful reference. The editor, a practicing attorney, sought the aid of business and trade associations, drew from existing dictionaires in specialized fields, technical societies, and government agencies.

Definitions are necessarily brief, but should provide adequate identification for most purposes. Where more data are needed, the aid of a handbook or text would be sought rather than a dictionary.

Perhaps the majority of terms included could not normally be found in a desk dictionary, or if included would not give the application to technical fields.

Errors are to be expected in the first edition of a work of this nature and some were found in the metalworking terms that were checked, but many terms were found with proper definitions. There were few errors of commission, more of omission. In general, the coverage of financial and legal terms appears more complete than of technical terms.

Unfortunately, initial capital letters are used (contrary to normal dictionary style) making the volume of little value in determining what normal practice with the word is. In some cases, definitions clear this up by stating whether the word is generic or a trade mark.

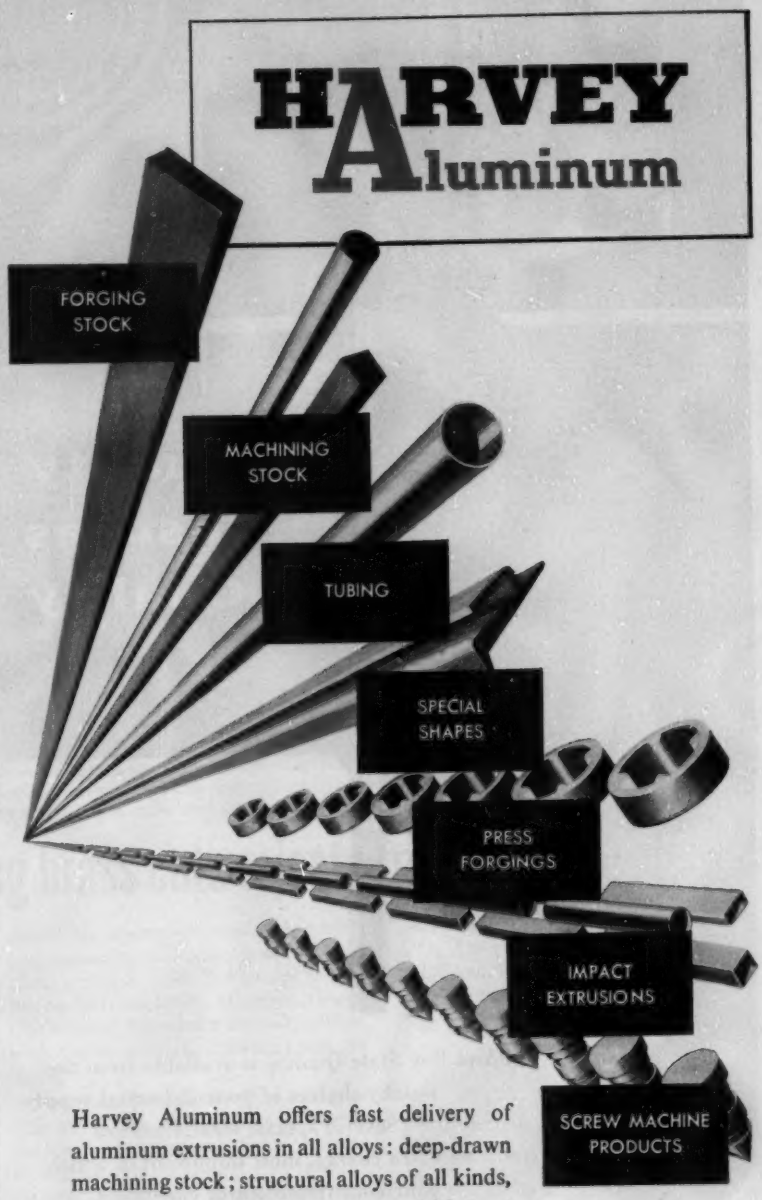
Despite these objections, the reviewer thinks Mr Schwartz has done a remarkable job in attempting a truly monumental task.

•

FORMING AND BENDING KAISER ALUMINUM—*Published by Kaiser Aluminum & Chemical Sales, Inc, 919 N Michigan Blvd, Chicago 11, Ill. 260 pages. Price $2; free when requested on company letterhead.*

Readers of *American Machinist* have seen material from two chapters of this book in recent issues—"How to

It will pay you
to fill your aluminum needs at



Harvey Aluminum offers fast delivery of aluminum extrusions in all alloys: deep-drawn machining stock; structural alloys of all kinds, including the world's strongest; special impact extrusions; close-tolerance furniture tube sold by the foot. Costs are low...quality is high... service is fast...and Harvey prepays the freight.

HARVEY ALUMINUM SALES, INC.
TORRANCE, CALIFORNIA
BRANCH OFFICES IN PRINCIPAL CITIES

An independent producer of aluminum extrusions in all alloys and all sizes: special extrusions, press forgings, bar stock, forging stock, tubes, impact extrusions, aluminum screw machine products and related products.

And Bay State Quality is available from the nearby shelves of your industrial supply distributors. Several special treatments are furnished at no extra charge, most important of which is the courteous treatment of customers.

BAY STATE TAPS

BAY STATE TAP & DIE COMPANY MANSFIELD, MASS.

bend aluminum tube and bar" (*AM*—May 24, '54, p137), and "How to stretch-form aluminum" (*AM*—Jul 19, '54, p133). These two subjects have been least thoroughly covered in previous works on aluminum forming and are likely to be of the most immediate interest.

These two chapters were considerably condensed in publication, but they indicate the type of material the book contains. Other subjects include press forming, press-brake bending, rubber forming, roll forming, and spinning. There is also a glossary.

Preparation has evidently not been hasty, and the coverage is detailed. Although aluminum producers have generally done a better job of providing detailed technical information than the producers of other metals, this book is a worthwhile addition to those already available.

•

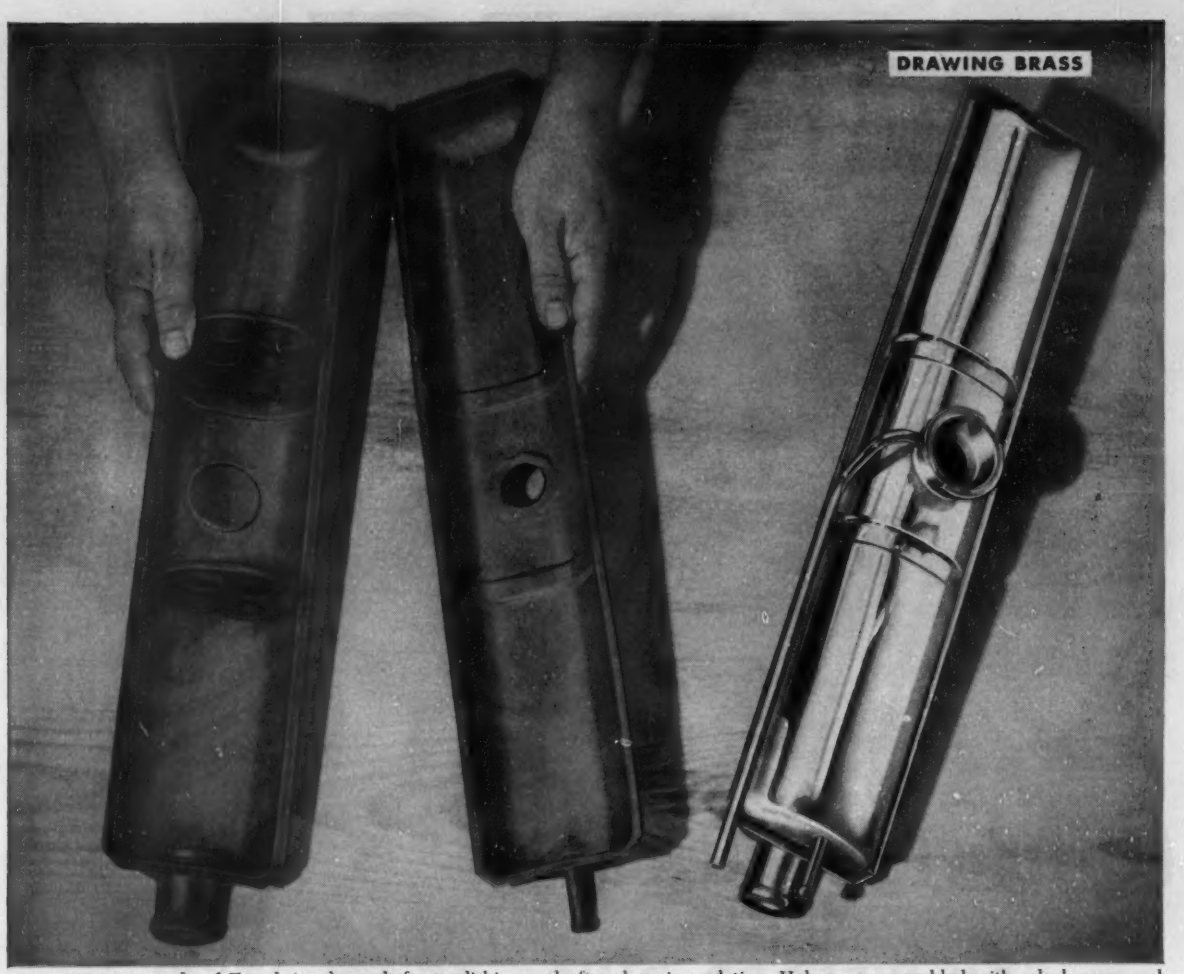
ELEMENTARY TOOL DESIGN—*By Elmer B Benson. Published by Chas A Bennett Co, 237 Monroe St, Peoria 3, Ill. 217 pages. Price $4.76.*

The market for this text is in secondary schools, for which it covers the tooling waterfront in a fairly light, uncomplicated manner. Starting with a brief survey of shop practice, it touches on drafting, material specifications, blueprint reading, design details, jigs, fixtures, gages, dies—in fact, the works.

Illustrations are mixed—some good, some not so good; but many drawings of fixtures, parts, and tool details are presented. Plentiful data for the student is presented in the form of standards tables, illustrations of drills and cutters, conversion tables, and the like.

After the first few chapters, which take up perhaps too elementary drafting-room and shop practice, the explanations of tools and dies is clear, on the average suitably illustrated, and quite adequate for a student.

"Big Burrs!"



RADIATOR TANK made of Formbrite shown before polishing and after chromium plating. Halves are assembled with a lock seam and soldered together with baffles inside. Intake spout, overflow tube and connecting fitting are also attached.

New fine-grain drawing brass cuts rejects from 13% to under 1%

These radiator tanks—used in a leading sports car—were first made of ordinary drawing brass.

But Morrison Steel Products Company, Buffalo, N. Y., found this brass wasn't stiff enough after forming. During handling, polishing and plating, many dents and nicks appeared on the surface. Rejects ran at about 13%.

Then Morrison turned to Formbrite* — Anaconda's new fine-grain drawing brass. Here's what happened.

1. Rejects dropped to less than 1%.
2. Appearance of the final plated tank (very important in a sports car) was so much improved that now Formbrite is specified for all these tanks.
3. Polishing costs were sliced almost in half.

WHY MORRISON FOUND FORMBRITE BETTER, CHEAPER TO USE

Formbrite has a superfine grain. Produced by special methods of rolling and annealing, this grain is *so fine* that often a simple color buff brings it to a bright, lustrous finish. (Compare magnification of Formbrite Drawing Brass with that of ordinary drawing brass. At right.)

Formbrite is harder, stiffer, springier and more scratch-resistant. It resists denting and deforming. Yet Formbrite is surprisingly ductile . . . readily stamped, formed, drawn and embossed. And Formbrite plates beautifully.

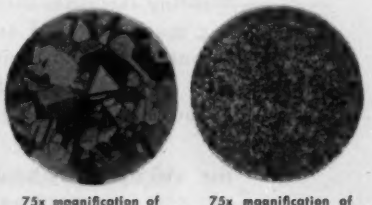
NO EXTRA COST

Premium price for this premium metal? Not at all. Formbrite costs not a penny more than ordinary drawing brass. It comes in sheets, strips and coils—in all commercial widths and gages.

FREE SAMPLE

The way to find out about Formbrite is to try it yourself. Ask for a sample and more information. Just write to: *The American Brass Co., Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

*Reg. U. S. Pat. Off. 5487



75x magnification of ordinary drawing brass. 75x magnification of superfine-grain Formbrite.

Formbrite

FINE-GRAIN DRAWING BRASS
an ANACONDA® product

Made by
THE AMERICAN BRASS COMPANY

Up where eagles soar

ON WELDED RINGS OF STEEL

Today's jets soaring higher, faster, and farther are a tribute to the imagination and resourcefulness of the aviation industry. American Welding is proud to have contributed to this effort as a supplier of rings, bands and welded assemblies for every major U. S. aircraft engine manufacturer. In many instances, American Welding furnishes these completely finished — welding, machining and assembly all having been done in our plant. Our various divisions working closely with customers have developed new techniques and methods to keep pace with progress in the industry.

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FOR AUTOMATIC, LOW COST
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FROM COOLANTS AND CUTTING OILS

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MILLING MACHINES
GEAR SHAPERS
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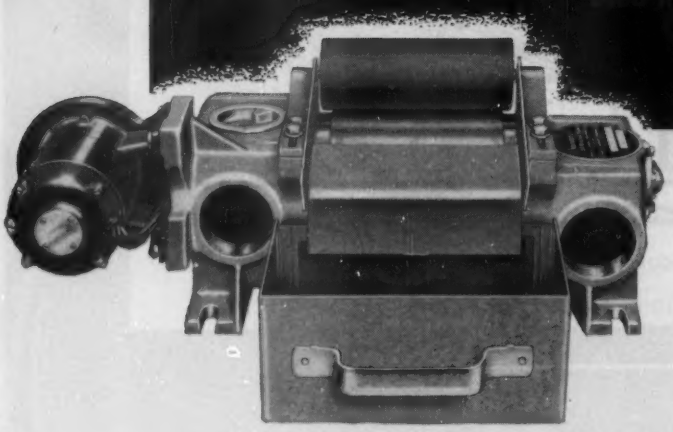
HONING MACHINES
BROACHING MACHINES
and many others



NOW . . . a *completely new* Magnetic Separator designed to remove ferrous metallic particles and sludge from liquid coolants, mineral oils and soluble oil solutions used in all types of ferrous metal finishing operations. Automatic, continuous cleaning of coolants with the Houdaille Magnetic Separator provides:

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- **Longer Wheel & Tool Life**
- **Better Finishes with Fewer Rejects**
- **Greater Safe-Use Life of Oil or Coolant**
- **Lower Operating and Maintenance Costs**

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Permanent ring magnets enclosed in revolving cylinder provide 360° of magnetic attraction. Evenly distributed . . . no spottiness. Assures complete removal of ferrous particles from coolant.

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Separator uses 1/70 hp. (4.8 RPM) gear head motor (TENV). Features smooth, automatic operation. Nothing to lubricate, nothing to get out of order. Can be operated in many cases off present 110-volt control circuit.

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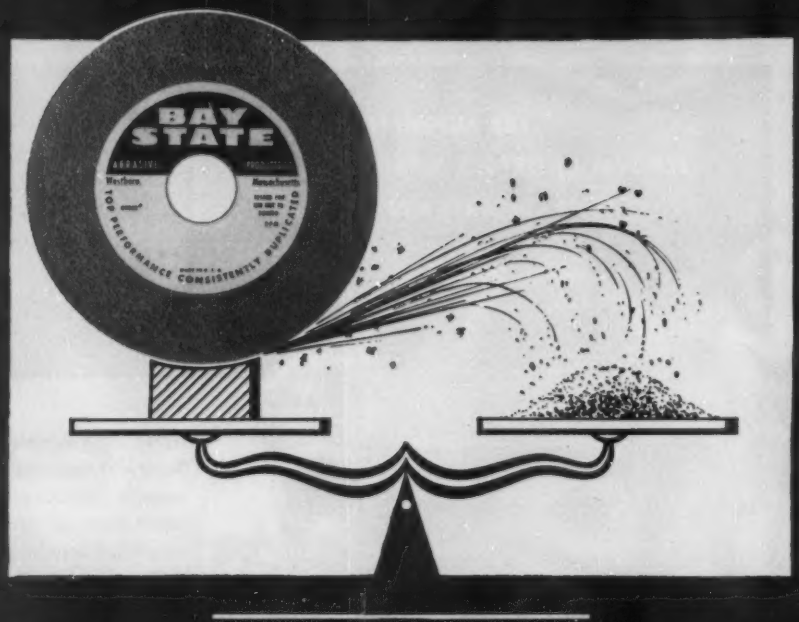

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of the *grinding* it does . . . not by its price.

This real value can be determined only
by finding the cost per pound of stock removed
and checking the accuracy and finish of the surface
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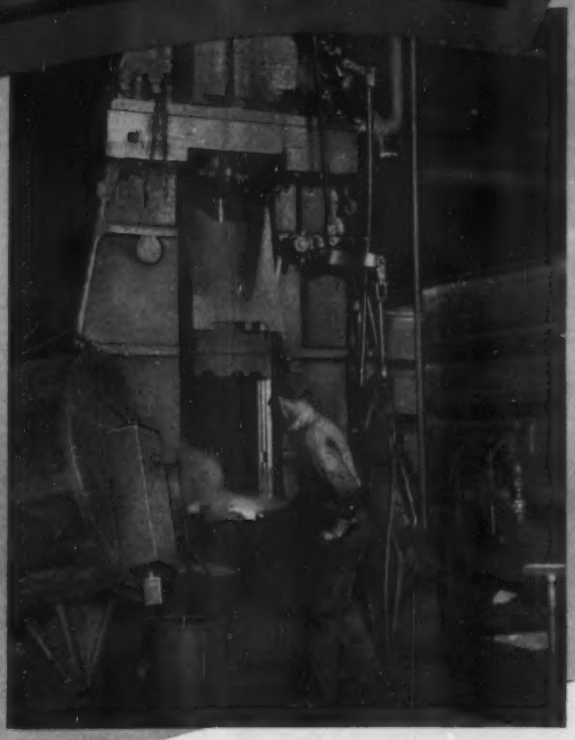
18 ERIE STEAM HAMMERS...



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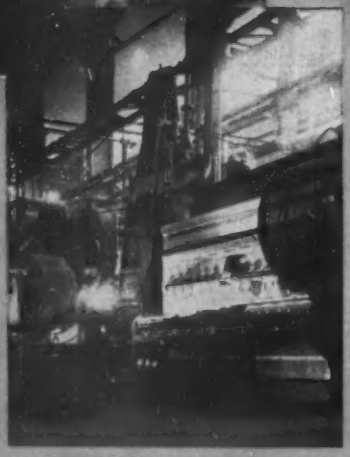
2.



3.

at Canton Forge Plant of Ford Motor Company

1. This 2500 pound Erie Steam Hammer produces 360 forged components per hour for the Ford front suspension.
2. Forging light truck spindles 3¼ inch stock at the rate of 75 to 90 pieces per hour is the job of this 4000 pound Erie Steam Hammer.
3. This battery of Erie Steam Hammers is kept busy on Forgings for Ford automobiles at the Canton Forge Plant.

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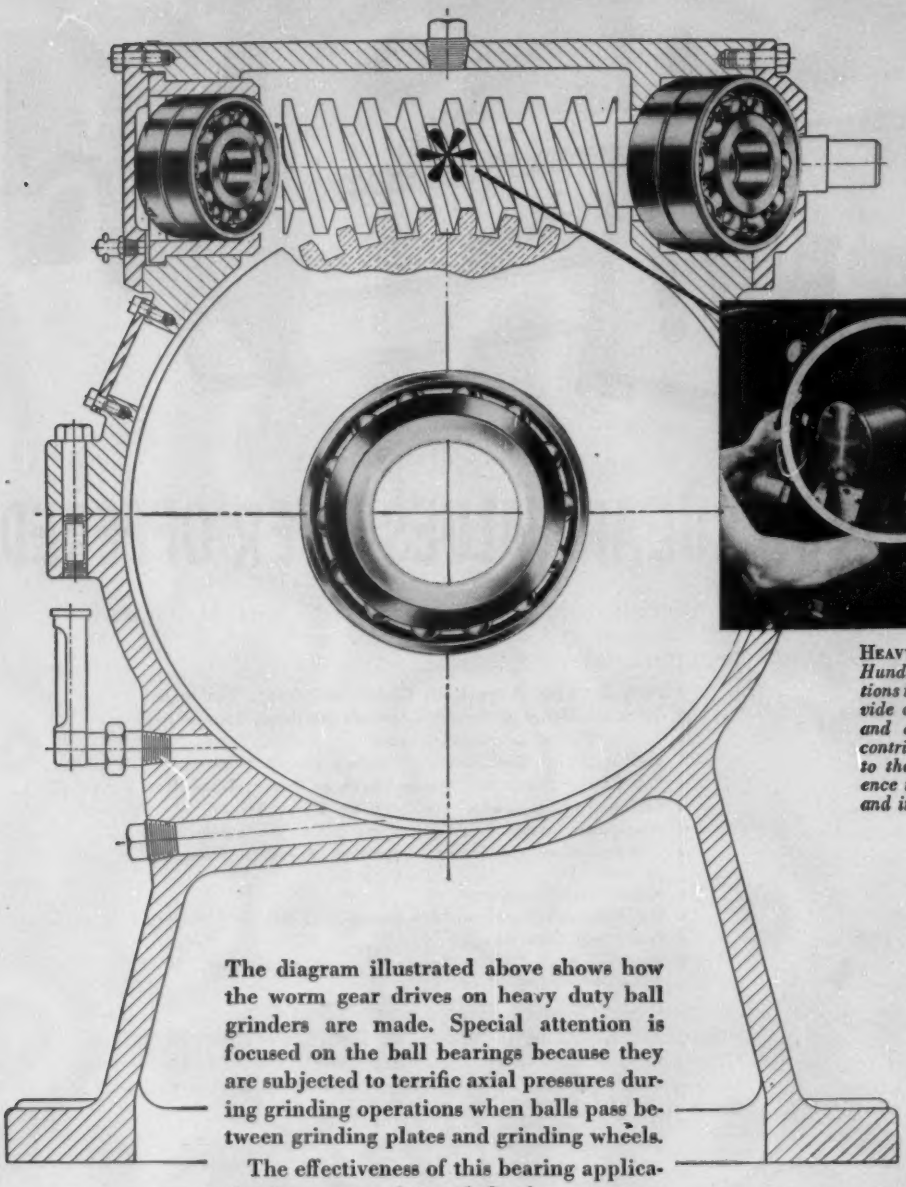
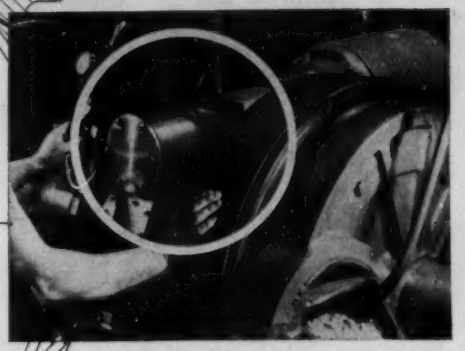
on Fafnir Ball Bearings





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The diagram illustrated above shows how the worm gear drives on heavy duty ball grinders are made. Special attention is focused on the ball bearings because they are subjected to terrific axial pressures during grinding operations when balls pass between grinding plates and grinding wheels.

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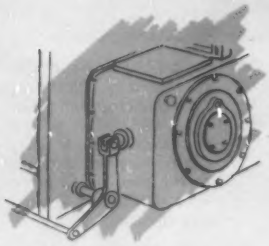
BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

THE GREATEST SHEAR VALUES EVER OFFERED



Fully Enclosed Drive Unit. Gears Run in Oil.

Straddle Mounted Gears. Longer Gear Life.

9-Jaw Clutch. Positive. Unsurpassed in Performance.

You will be pleasantly surprised to learn how little it costs to own and operate a shear with each of the fine features listed below:

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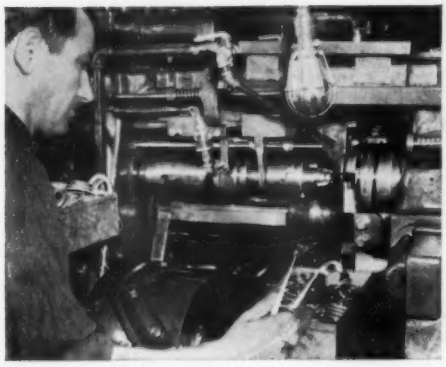

Put parts in the pan 90% as fast as Bessemer screw stock

You can give duplicate parts the high physical and chemical properties of stainless steel. And, you can do it without a heavy production penalty!

Simply set up and run Free-Machining ENDURO Stainless Steel Bars. They'll respond beautifully at every station on your automatics. Two grades are fully 90% as machinable as Bessemer screw stock.

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Free-Machining ENDURO also is available in hot-rolled bars and in wire. Republic metallurgists and machining advisers are ready to help you apply ENDURO every step of the way. Just write:

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NEW! **96-page pocket size booklet, "How To Machine Republic ENDURO Stainless Steel Bars." Packed with machining tips, tables of feeds and speeds, stainless steel properties, other vital information. Write Republic. Ask for ADV-607. FREE!**

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hydraulic drive...a natural for

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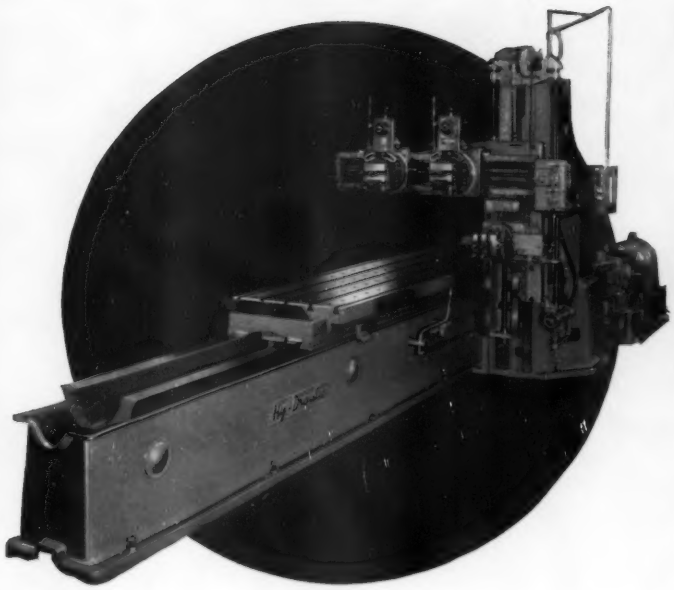
reciprocating machine tools



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Fast Operation
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Long Tool Life

Unmatched for the efficient, economical handling of work that is somewhere in size between shaper and planer capacities.

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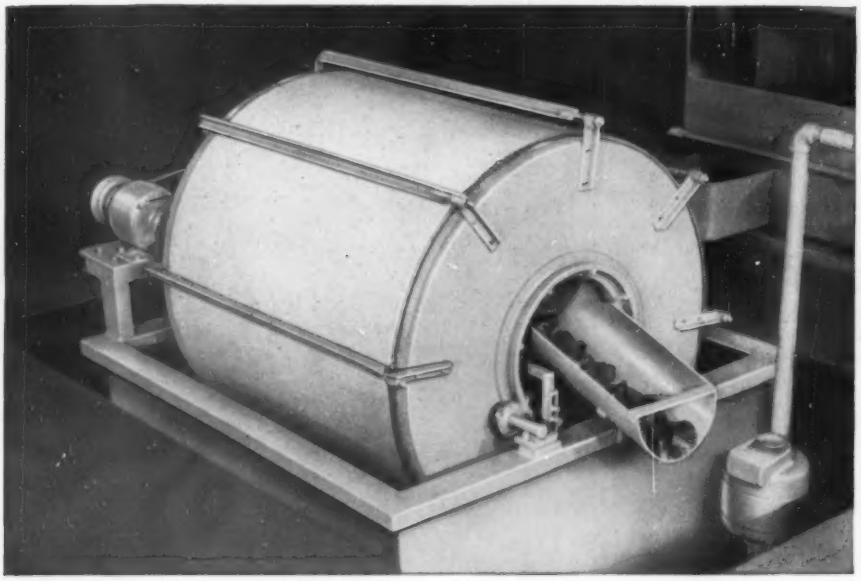
A Revolutionary Development in Solution Reclamation That Gives You These Money-Saving Features!



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AUTOMATIC POLISHING, BUFFING, GRINDING EQUIPMENT

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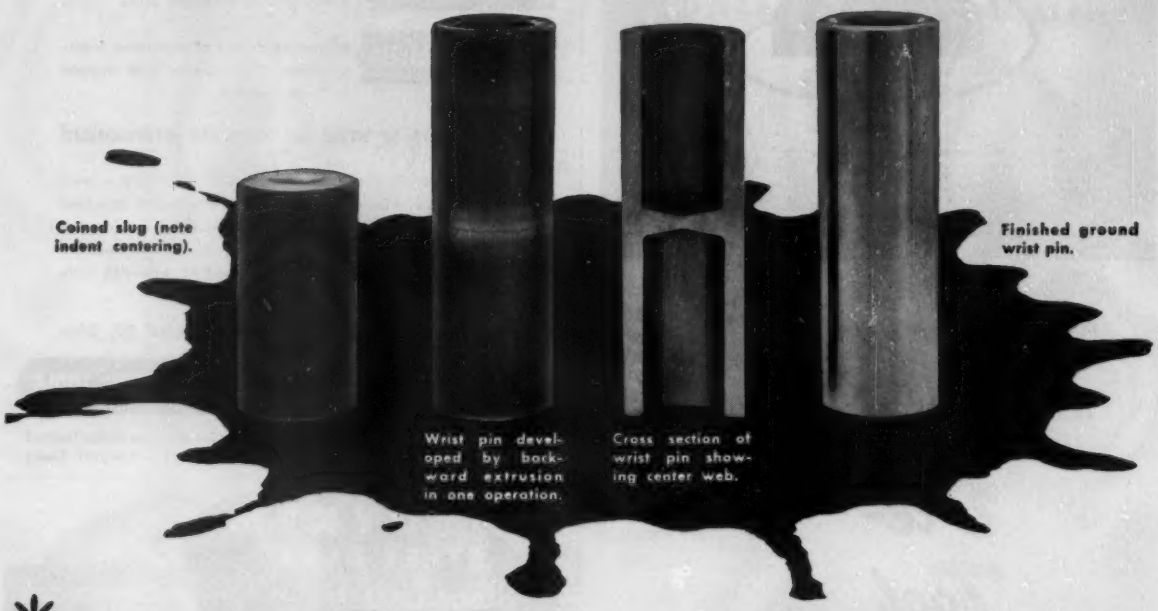
Coined slug (note indent centering).
Wrist pin developed by backward extrusion in one operation.
Cross section of wrist pin showing center web.
Finished ground wrist pin.

*as a separating layer and lubricant carrier is the key to the success of COLD FORMING

Present day deep draws and cold extrusions were labeled "impossible" just a few years ago. Tool design, production techniques and lubrication have improved. Especially lubrication.

Treatment with Bonderite and Bonderlube has been the key to successful production of extruded parts large and small.

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Draw on Parker's unique store of knowledge and experience in extrusion. Call in the Parker representative.

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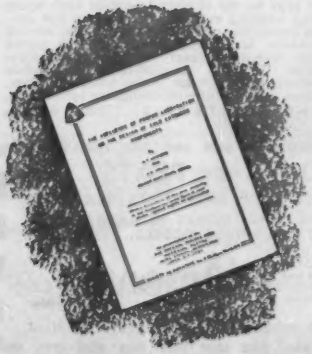

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Stops Losses making Dies and Templates

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WITH THE MODEL 9A MARKING MACHINE, COMES IN HAND, MOTOR AND AIR DRIVEN MODELS.

If you make precision parts you need the 9A machine.

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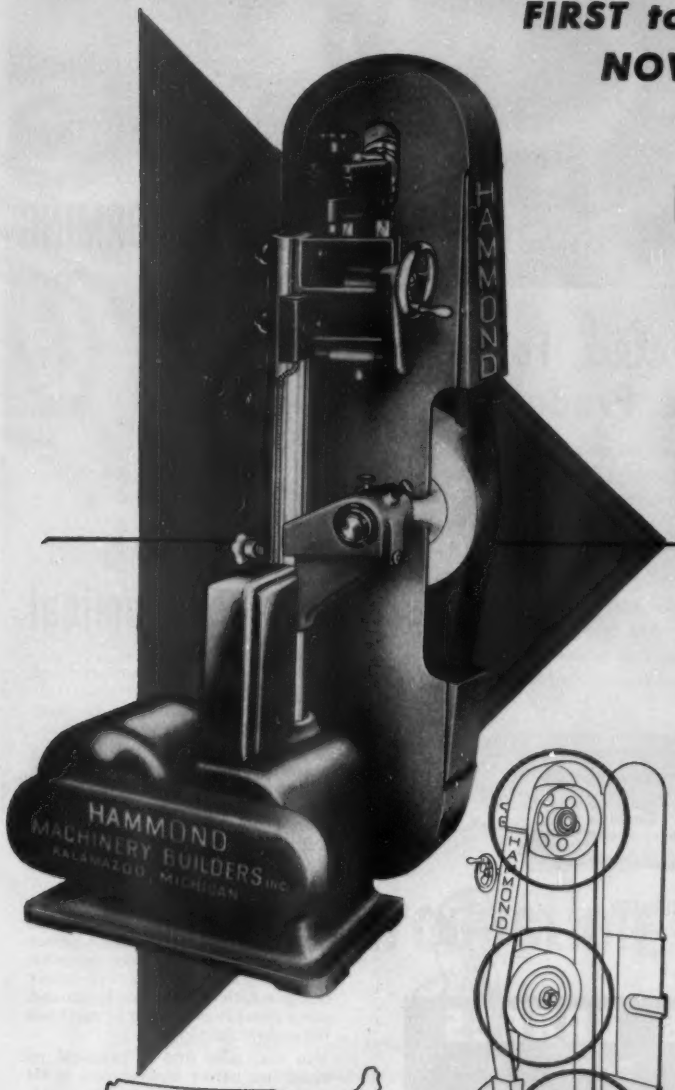
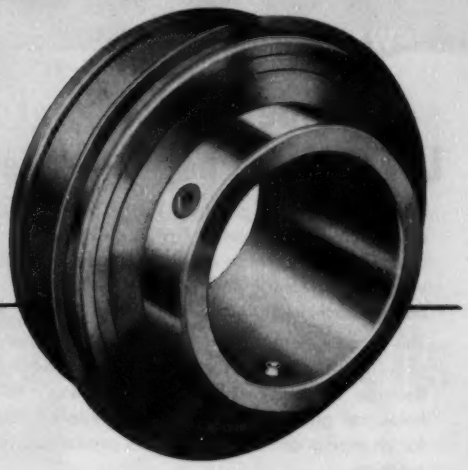
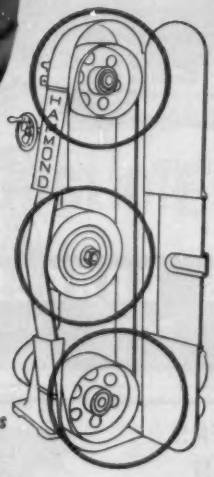
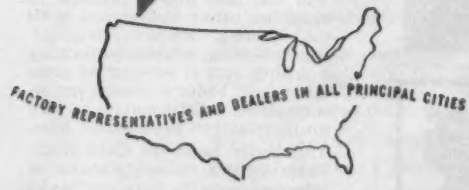
*Hammond contour abrasive belt finisher, FIRST to feature ball bearings, NOW chooses . . .

SEALMASTER BALL BEARING UNITS







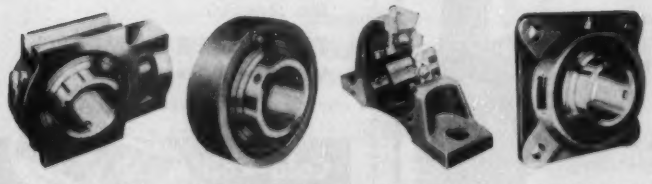


Featured as one of the important sales points of Hammond's Model 66 Contour Abrasive Finisher are the SEALMASTER BEARINGS —an integral component in the machine's smooth operation. Use of the SEALMASTER BEARING units has eliminated the costly maintenance resulting from the use of non-permanently sealed bearings. Smooth running spindles are assured with minimum vibration, end play and spindle whip.

Close cooperation between SEALMASTER sales engineers and original equipment manufacturers such as Hammond Machinery Builders has helped raise the standards of product performance in both newly developed and time-tested machinery.

If you're planning a new product or seeking ways to improve a present one, why not take advantage of SEALMASTER engineering assistance? SEALMASTER factory representatives and dealers are located in all principal cities.

HAMMOND MACHINERY BUILDERS, INC.
1600 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN



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SEALMASTER
BALL BEARING UNITS

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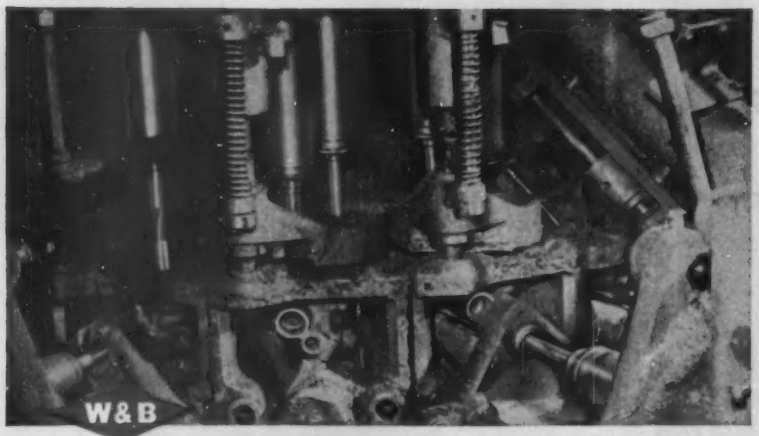
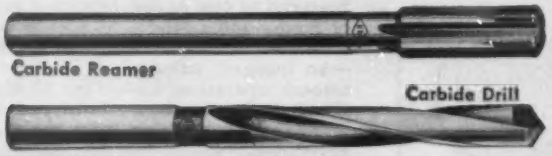


Carbide Drills *Selected* For Long-Life and Increased Production

Illustrated above is a fifteen station vertical automatic indexing machine using sixteen Whitman & Barnes carbide drills ranging from ¼" to 9/16" diameter, two carbide core drills and one carbide reamer. Simultaneous vertical, horizontal and angular drilling of oil pump bodies is done on this machine.

This large manufacturer of automobiles selected W & B carbide drills as a means for increasing production of these cast iron oil pump bodies. Because W & B carbide drills have extra-long-life and provide more holes per grind, his drilling cost is reduced, there are fewer shut-downs for changing drills and maximum production time is obtained from each machine.



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Save your large JIG BORERS for large jobs... put small precision work on the LINLEY...

The Linley Jig Borer provides the means . . . at very low cost . . . of handling your most exacting requirements in precision. With it you can cut costs through having a tool exactly fitted to your small work . . . save your larger machines for larger work.

Specifications

Table Movement: 6" x 10" Table Size: 7" x 17½"

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ENGINEERING YODER MANUFACTURING

Typical application for Atlantic cutting oils, showing a Barber-Colman milling machine.

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for high production on tough jobs

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With these new Atlantic non-soluble cutting oils, you can maintain high production rates without the handicap of foul odors on hot tough jobs. Work is visible right through the oil. And the oils are compatible when blended—even down to the heaviest grades. Operators like these new oils better too, because they don't indelibly stain hands or clothing.

Get complete information on these new oils and your copy of the Atlantic Cutting Oil Selection Chart. Learn about this superior measure for cutting oil efficiency . . . determined by performance rather than chemical composition. Write your nearby Atlantic office listed below, or The Atlantic Refining Company, 260 South Broad St., Philadelphia 1, Pa.

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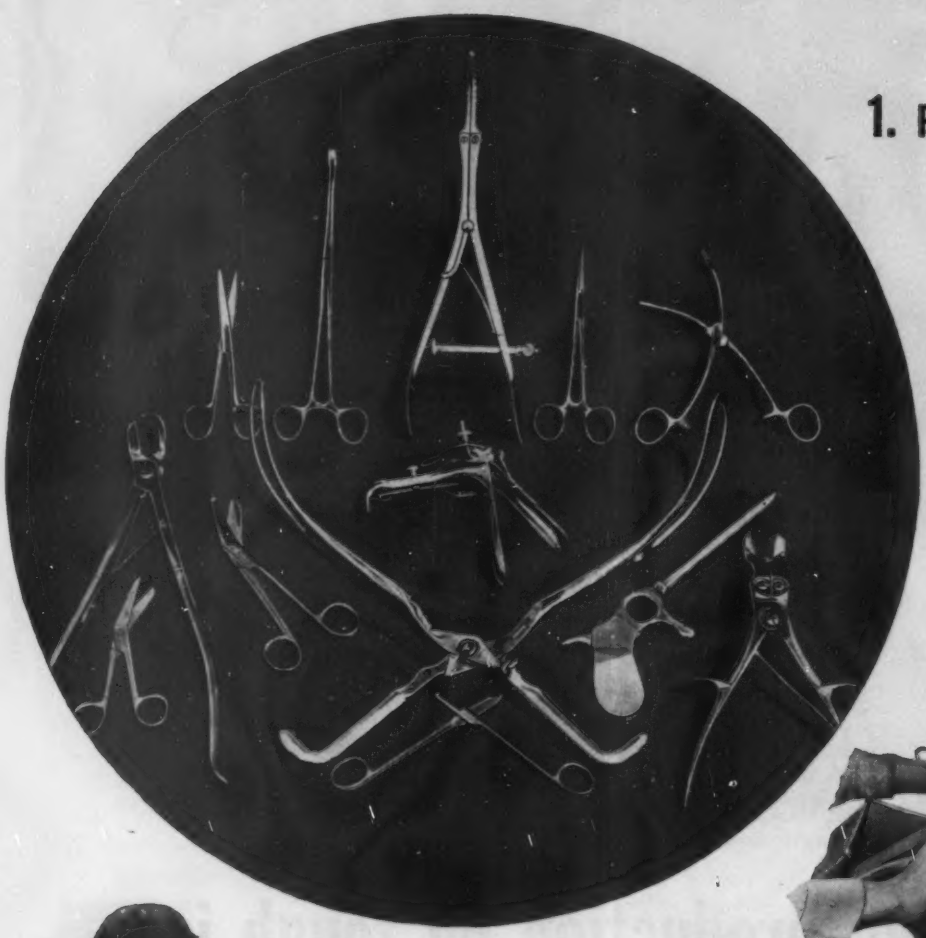
HOW WOULD YOU SOLVE IT?



1. PRODUCTION PROBLEM:

To produce a more uniform finish on the multiple contours of stainless steel surgical instruments and cut unit costs of finishing and polishing. Witte & Schmitz Surgical Instrument Co. was using set-up wheels which left unsatisfactory finishes, tired operators.

2. SOLUTION:

A 3M Representative suggested that this Bridgeport, Conn. manufacturer switch to the 3M Backstand Method using Three-M-ite "Resinite" and Three-M-ite Cloth Belts. A 3M Methods Engineer helped the firm make up their own spindles and mounted wall idlers to make best use of limited space.

3. RESULTS:

An immediate 25% production increase with a far superior finish on the instruments. Too, the manufacturer found that unskilled workers could be trained to polish the multiple contours more rapidly, and there was less operator fatigue. 3M Representatives can help solve *your* grinding problems, too. Send coupon for facts.

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Minnesota Mining & Mfg. Co.
Dept. AM-94, St. Paul 6, Minn.

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☐ Have 3M Representative call.

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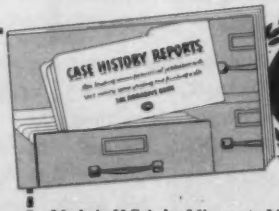

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Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.
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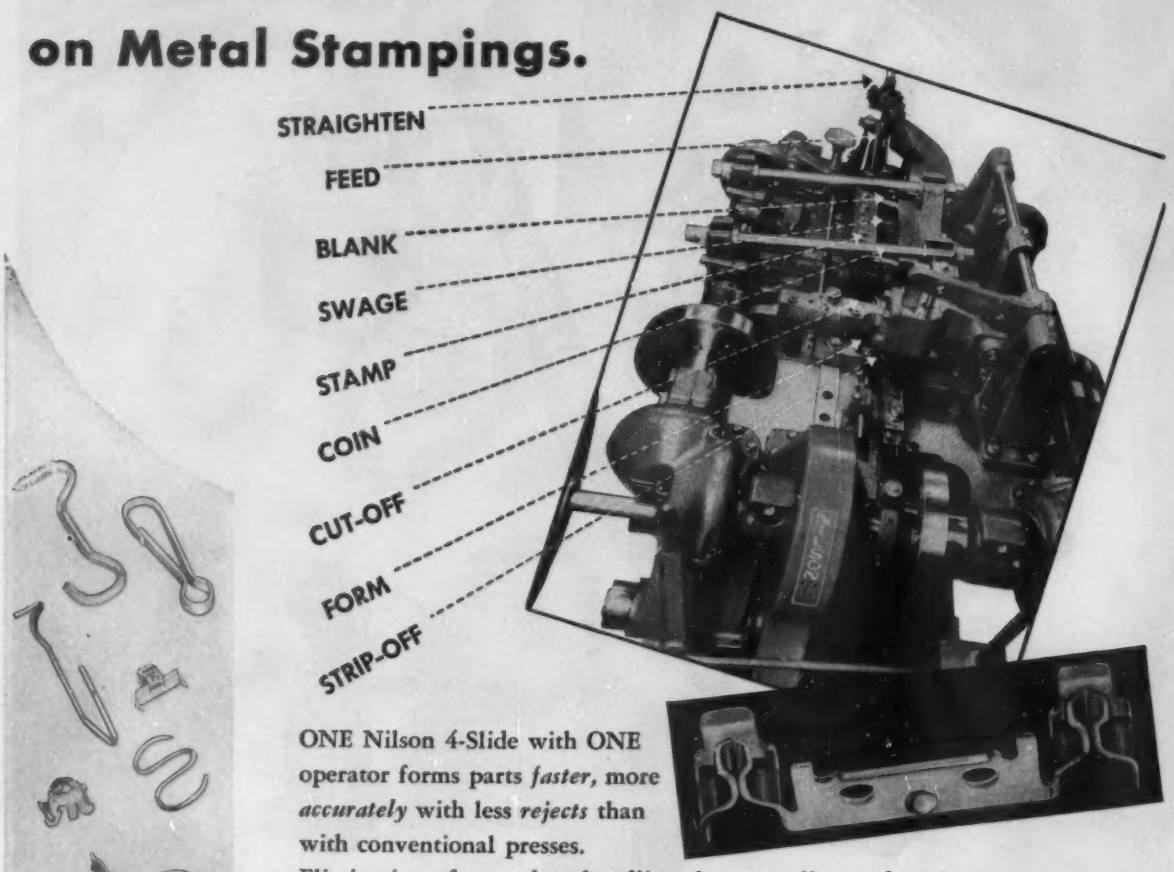

ONE Nilson 4-Slide with ONE operator forms parts *faster*, more *accurately* with less *rejects* than with conventional presses. Elimination of secondary handling, lower tooling and set up costs *means added profits*. Wide range of models for wire and ribbon metals. Feed lengths to 32", stock widths to 3½". Press capacity to 75 tons.

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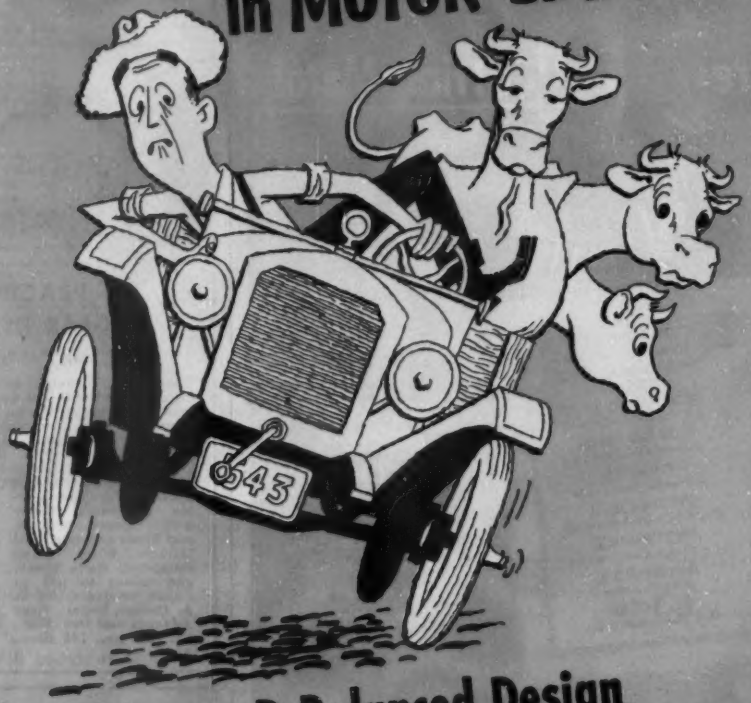

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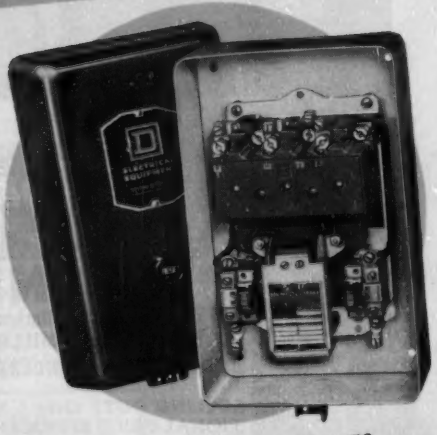

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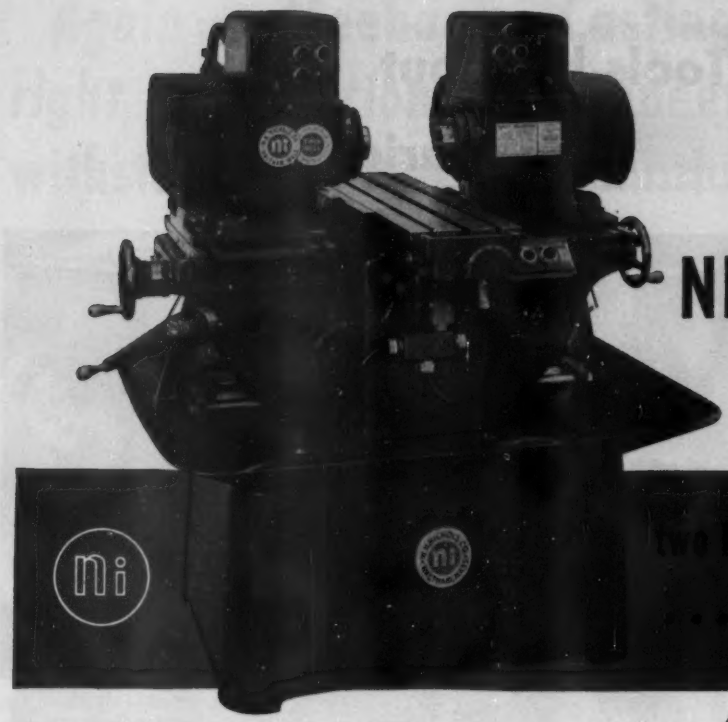


NICHOLS TWIN MILL

two heads are better than one ... for sure!

The Nichols Twin Mill is something new in duplex millers — a precision 2-spindle bed-type miller designed for simultaneous light duty milling of opposite or adjacent surfaces, using **horizontal or vertical spindles.**

The Twin Mill provides unmatched flexibility! It is equally adaptable for long-run or short-run jobs. The two geared milling heads are independent units, with separate 1 HP motor drives, and are quickly adjusted either directly opposed or offset longitudinally, vertically or transversely. Set-up is fast and simple.

The wide range of spindle speeds from 55 to 2050 R.P.M. allows milling of ferrous or non-ferrous materials with high speed or carbide tipped cutters, producing EXTRA FINE FINISH while maintaining the closest tolerances with ease.

The Twin Mill is completely push-button controlled, arranged for automatic table cycling — with rapid approach, hydraulically controlled variable cutting feed and rapid return. Available with automatic retraction of milling heads, automatic spindle brakes and carefully engineered special features to meet specific applications.

The parts shown are typical of those on which the Twin Mill is cutting costs and boosting production. Investigate the savings it can make for you. For details write to Nichols-Morris Corporation.

CONDENSED SPECIFICATIONS

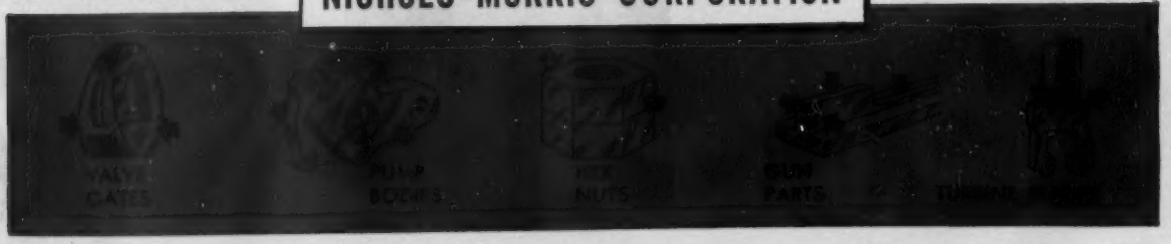
Table, working surface	8⅝" x 30"
Table Travel—cutting stroke	11¾"
Motors	(two) 1 HP
Spindle Speeds (15)	from 55 to 2050 RPM
Max. height center of spindle above table	11¾"
Max. offset of spindles (horizontal)	8½"
Max. distance between spindle noses (across table)	16"
Floor space required	64" x 56"

Manufactured by W. H. Nichols Company, 48 Woerd Avenue, Waltham 54, Mass.

76-F Mamaroneck Ave.

NATIONAL DISTRIBUTORS
NICHOLS-MORRIS CORPORATION

White Plains, New York



13 Key Moore Tools help put the PRECISION in Harig Dies

KARL HARIG

"When owner-management invests its money in machinery," says Karl Harig, founder and president of Harig Manufacturing Corporation, "it does so only after a thorough analysis and careful selection of available equipment." So it's significant that Harig, one of America's foremost producers of carbide, lamination, progressive, stamping and other types of precision dies, employs 13 Moore precision-built machine tools for many of its most critical toolroom operations.

A trip through Harig's modern Chicago plant reveals:

3 MOORE JIG BORERS, for accurate locating and boring of holes in a fraction of the time required by other means;

6 MOORE JIG GRINDERS, for relocating and grinding of holes and contours—within tenths—after hardening;

3 MOORE PANTO-CRUSH WHEEL DRESSERS, for speedy, cost-cutting performance of both crush-forming and diamond-dressing on the wheel spindle of a surface grinder;

1 MOORE DIE FLIPPER, for "mechanized" die tryouts and assembly.

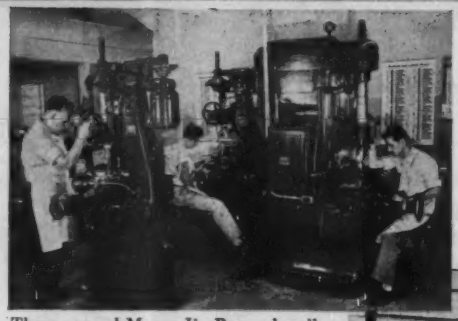
The combination of Harig craftsmanship and Moore precision tools has been an important factor in Harig's successful effort to meet continuing demands for faster production of intricate dies, tools, jigs, fixtures and gauges.

Why not discover how Moore tools can bring more speed and greater accuracy to *your* toolroom. Write today for our detailed literature.

Moore Special Tool Company, Inc.

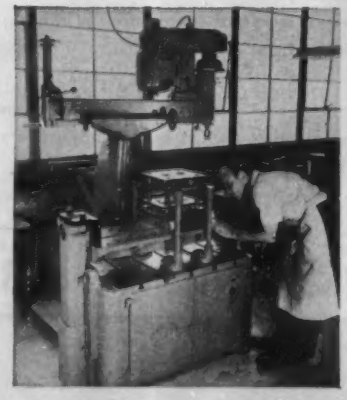
738 Union Avenue, Bridgeport 7, Connecticut

A battery of six Moore Jig Grinders performs precision internal and contour grinding operations on sectional die parts at the Harig plant.



Three rugged Moore Jig Borers handle the bulk of Harig's critical spotting, drilling, boring and reaming operations.

Harig uses this Moore Panto-Crush Wheel Dresser on a surface grinder for fast pantograph profile grinding. Harig also has two more of these cost-cutting units.

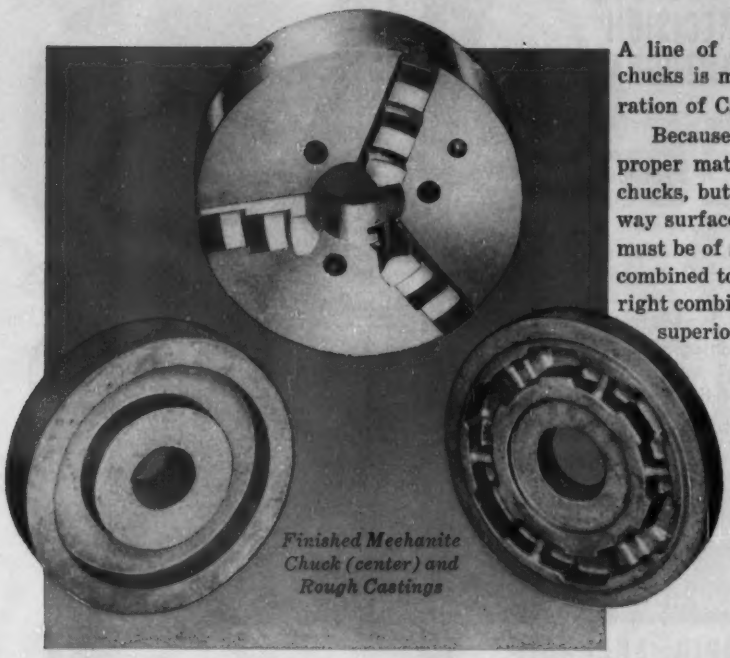


A Moore Die Flipper facilitates accurate die tryouts and assembly at Harig, replaces time-consuming hand-labor methods.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

Again... Meehanite Castings contribute the *right combination* of engineering properties to withstand a *severe* combination of service loads



Finished Meehanite Chuck (center) and Rough Castings

A line of independent and universal machine tool chucks is manufactured by the Williams Tool Corporation of Canada Limited, Brantford, Ontario.

Because of the extreme importance of having the proper material not only for the main body of the chucks, but to provide maximum performance of the way surfaces, Meehanite castings are specified. They must be of sufficient strength and size so as to handle combined tool and work holding loads, and assure the right combination of strength and wear resistance for superior service life.

Builder Says:

"Meehanite castings provide these desirable characteristics without any penalty in machining time."

ONLY A MEEHANITE FOUNDRY CAN MAKE MEEHANITE CASTINGS

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Pantograph reductions from 1:1 to 1:40. Spindle speeds infinitely variable from 1,200 to 11,500 RPM without belt changing.

Extreme accuracy and freedom of motion. Write for "Panto-Miller" details.

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This indexing trunnion, with station selector, accurately holds and locates either jig or work. SIMPLIFIES JIGS. REDUCES SET-UP TIME.

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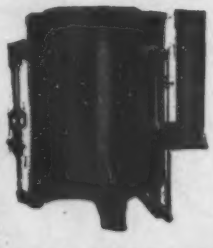

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SAFE, UNBREAKABLE
high speed blades
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Order any of the complete line of STAR Blades from your Industrial Distributor – your best source of supply for hundreds of the items you need to operate efficiently, economically, and without production interruptions. 1018

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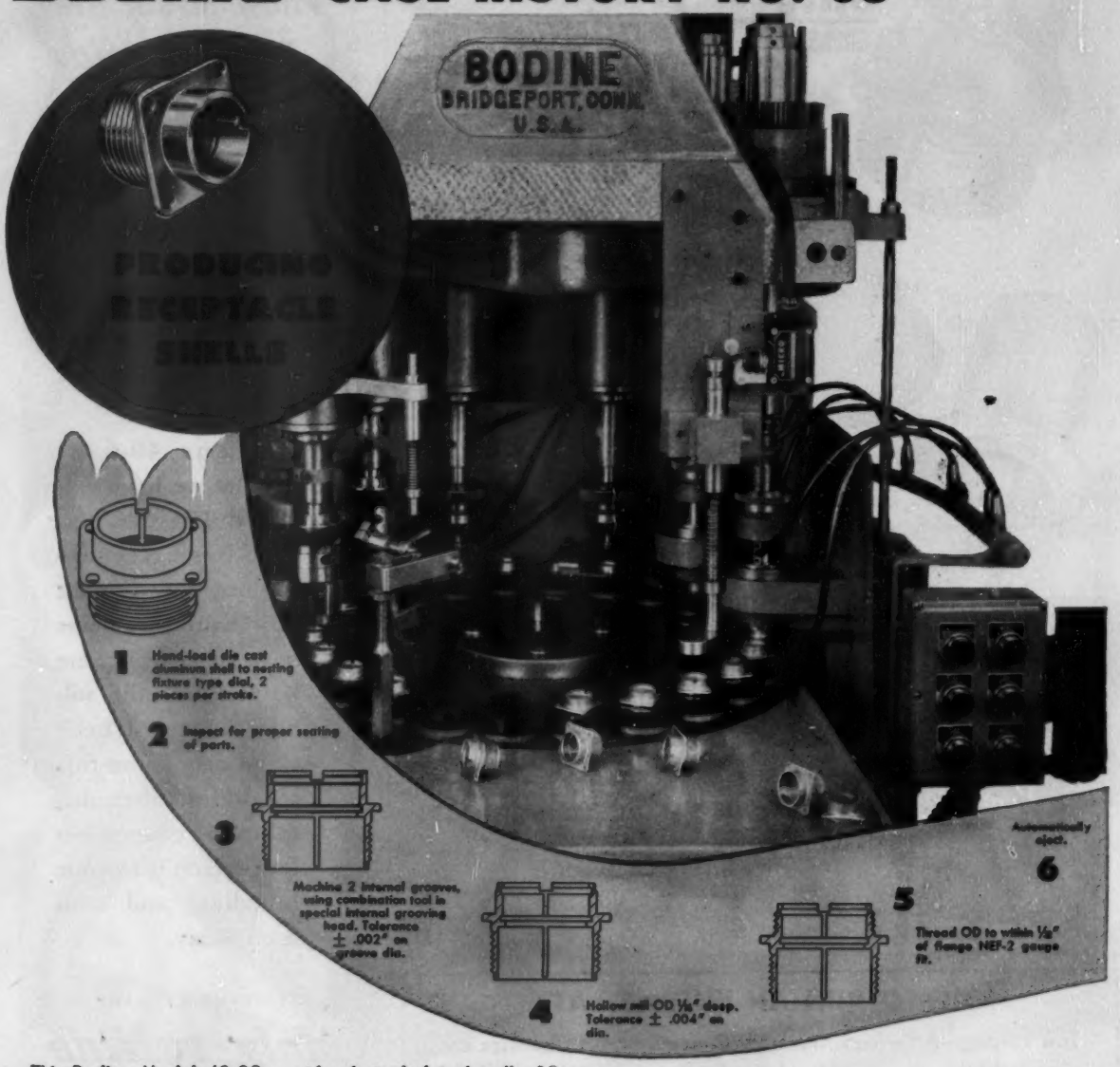
Makers of Hand and Power Hack Saw Blades, Frames, Metal Cutting Band Saws and Clemson Hand and Power Lawn Machines.

Bodine CASE HISTORY NO. 38


BODINE
BRIDGEPORT, CONN.
U.S.A.
1 Hand-load die cast aluminum shell to nesting fixture type dial, 2 pieces per stroke.
2 Inspect for proper seating of parts.
3 Machine 2 internal grooves, using combination tool in special internal grooving head. Tolerance ± .002" on groove dia.
4 Hollow mill OD 1/8" deep. Tolerance ± .004" on dia.
5 Thread OD to within 1/8" of flange NEF-2 gauge fit.
6 Automatically eject.

This Bodine Model 48-30 machine is tooled to handle 13 receptacle shells ranging from 7/16-27 to 1 3/8-18 NEF 2 threads. Shells are used for multiple terminals in TV, Radar, etc.

PRODUCTION: From 1,600 to 2,200 pieces per 50-minute hour, depending on size of shell.

Potentiometers next to push button station regulate two electronically controlled variable speed motors. Positive, accurate control over spindle rpm and over rate of feed gives lead-screw accuracy to the threads with a non-reversing spindle.

Bodine machines (of four types) may be tooled for an extremely wide variety of high speed repetitive production jobs . . . including drilling, tapping, threading, screw inserting, light milling, and assembly. For a true picture of cost cutting, write Dept. AM-9 for our brochure "Bodine Presents 12 Typical Case Histories."

"You Can't Meet Tomorrow's Competition with Yesterday's Machine Tools."

THE
Bodine
CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

9BD54

Only *Lamina* GUIDE PIN BUSHINGS . . . offer you all these benefits

1 Bronze electroplated on hardened steel* to combine strength with free, smooth action . . . eliminates seizing and scoring.

2 Inside diameter of bronze plated and steel bushings spray quenched to guarantee uniform hardness throughout entire length of bushing.

3 Bronze plated and steel bushings strain relieved to hold their size and shape indefinitely.

4 Precision manufacturing and rigid inspection to maintain closer tolerances.

5 Pre-finished hole to assure full length concentricity, better fit and longer life.

6 Honed hole to provide proper surface condition for precision fit and best lubrication.

7 Bearing surface extends full length of body . . . increases bearing area up to 25% . . . assures better alignment.

8 Figure eight oil groove for complete lubrication over entire area. Also, hydraulic action self-centers guide pin in the bushing.

9 Alemite fitting for easy, positive lubrication.

10 Specially designed retainers to securely hold the bushing in exact position . . . eliminates unknown holding strength of press fit.

11 Bushings have pre-fitted inside diameters and are wring-fit in the die shoe. This eliminates the possibility of distortion and necessity of hand honing after assembly. Too, positive alignment is obtained by seating the ground bushing shoulder on the finished die shoe surface.

12 Complete selection of styles, lengths, sizes and materials to suit any requirement.

Our illustrated bulletin and price list has all the details. Contact your die set manufacturer or write direct to us for your free copy.

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Drop-forged model with chrome finished micrometer head, from $8.25 up. Ask for Micrometer Catalog

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This tool with TUNGSTEN CARBIDE tipped anvils $15.75

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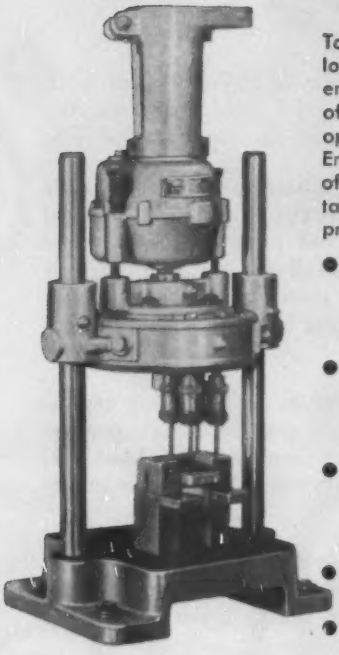
(Advertisement)

If you tap or drill small parts

you can't afford to be without— Ettco-Emrick

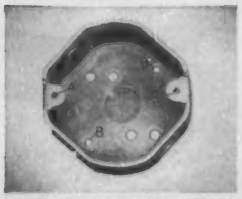
"UNIT-ENGINEERED" MULTIPLE HEADS



To put your small parts tapping and drilling on a low-cost, mass production basis you need specially engineered methods and equipment. Ettco's years of specialization in this field has led to the development and refinement of the Ettco-Emrick "Unit-Engineered" Multiple Head System, which is one of today's fastest, most economical methods of tapping and drilling small parts. Here's what it provides —

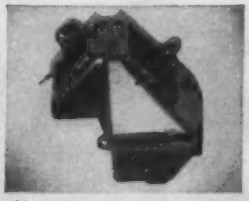
- *Multiple head and work holder engineered as a unit for your specific part to insure fastest handling and production with each stroke of the drill press.*
- *A selection of dozens of different standardized methods of handling a wide variety of shapes and sizes of parts and number and spacing of holes.*
- *Interchangeable tapping and drilling face plates to permit quick, easy changeovers from tapping to drilling — a patented Ettco-Emrick feature.*
- *A design that assures quick, easy installation on any make or model drill press.*
- *A limitless variety of spindle arrangements with capacities ranging from wire sizes to ⅝" in steel.*

DO JOBS LIKE THESE FASTER, EASIER, AT LESS COST



Steel outlet box with 4 tapped holes. Production—12,800 tapped holes per hour with dual multiple head unit.

54 holes drilled and countersunk in one operation with a multiple head and electric indexing fixture.



Die casting with 6 holes — 3 in each of two planes — automatically positioned and tapped in one operation.

If your small parts production calls for multiple drilling, reaming, countersinking, tapping or threading — it will pay you to check with Ettco. Call in your nearest Ettco-Emrick distributor or send us a sample or drawing for recommendations and estimates.

FOR DETAILS, WRITE FOR BULLETIN No. 3

Ettco-Emrick

ETTCO TOOL CO., INC.

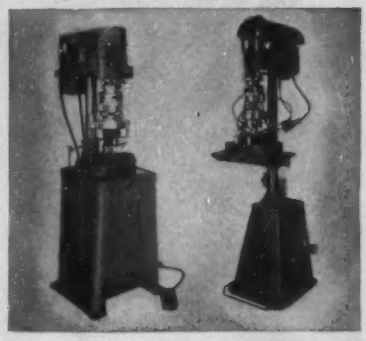
590 Johnson Ave., Brooklyn 37, N. Y.

DETROIT • CHICAGO • WORCESTER • SAN GABRIEL, CALIF.

Dealers throughout the United States and Canada

DRILLING and TAPPING EQUIPMENT NEWS

Tapping Machines Boost Multiple Head Output

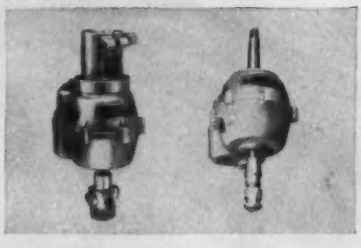


Ettco-Emrick tapping machines are designed for automatic or semi-automatic operation with multiple spindle drilling or tapping heads and single spindle tapping attachments. The No. 72A machine is foot or air-operated. The No. 74 machine is air operated and electrically controlled. *Details in Bulletins No. 72A and No. 74. Write Ettco Tool Co., 590 Johnson Avenue, Brooklyn 37, N. Y.*

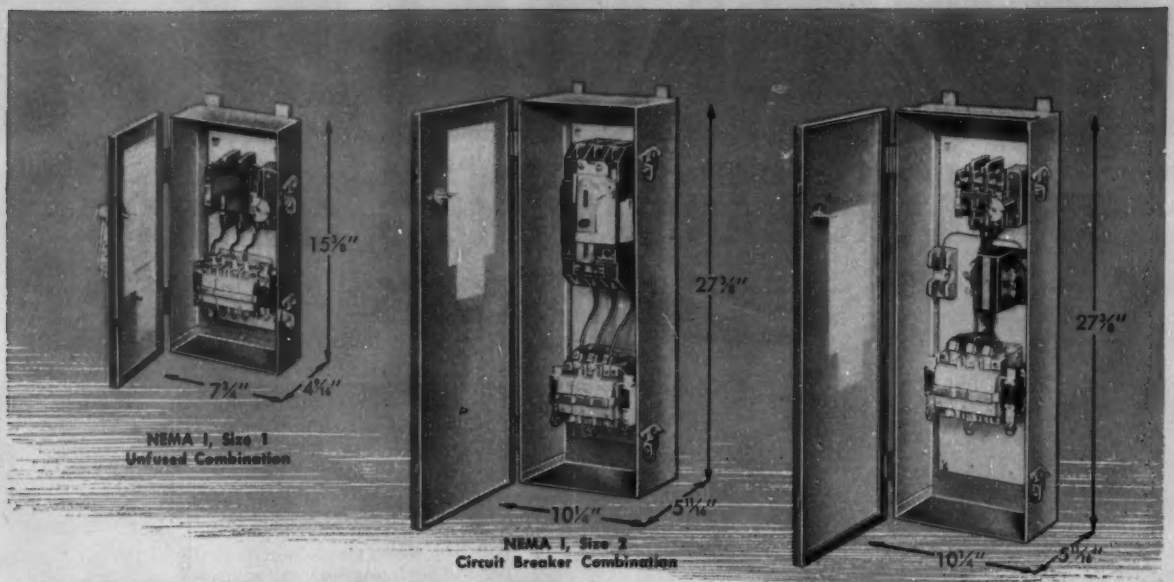
Electric Indexing Fixture Has Fast, Precise Action

Ettco-Emrick Indexing Fixtures provide smooth, shockless, positive action. Can be used on any machine base. Synchronization of index fixture with outside machine member is electrically controlled. Utilizes interchangeable nesting plates ranging from 10" to 14" in diameter. *Details in Bulletin No. 97. Ettco Tool Co., Inc., 590 Johnson Ave., Brooklyn 37, N. Y.*

Tool Up Any Drill Press For Fast, Accurate Tapping



Ettco-Emrick tapping attachments can be mounted on any drill press. Newly patented friction clutch provides the delicate sensitivity needed for high speed tapping or threading. 7 different models for No. 6 to ⅝" dies and for No. 0 to 1" taps. *Details in Bulletin No. 22. Write Ettco Tool Co., 590 Johnson Ave., Brooklyn 37, N. Y.*



New PERFORMANCE STANDARDS

for new machines or old with

ARROW-HART

TYPE "RAC"

COMBINATION STARTERS

ENCLOSURES:

- GENERAL PURPOSE (NEMA TYPE I)
- INDUSTRIAL USE (NEMA TYPE XII) . . . built to JIC STANDARDS
- Also for Textile and Other Industrial Applications

AVAILABLE:

- WITH DISCONNECT . . . Fused or Unfused
- WITH CIRCUIT BREAKER TYPE DISCONNECT
- IN ACROSS-THE-LINE, REVERSING and TWO-SPEED TYPES
- IN NEMA SIZES 0, 1, and 2
- WITH AND WITHOUT CONTROL CIRCUIT TRANSFORMER, LOCAL CONTROL, AND OTHER MODIFICATIONS

Combining radically smaller size and lighter weight with the advantages of advanced safety and dependability, these revolutionary Arrow-Hart Type "RAC" Combination Starters outwork . . . outlast . . . outmode every other type. An all-new, front-operated disconnect—a new line of enclosures in NEMA Types I and XII — and the exclusive A-H "Right Angle" Starter set new standards for maintenance ease, superior performance, and control versatility.

YES! Arrow-Hart Type "RAC" Combination Starters will help all machines—*old and new*—realize their full productive efficiency. Extreme dependability helps eliminate costly down-time . . . smaller size, easily accessible contacts, and extra room in the enclosure provide the ultimate in installation and maintenance ease . . . Straight-Thru wiring improves safety standards.

You owe it to yourself to write for complete information — NOW!

MAIL THIS COUPON TODAY

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Quality MOTOR CONTROLS • WIRING DEVICES
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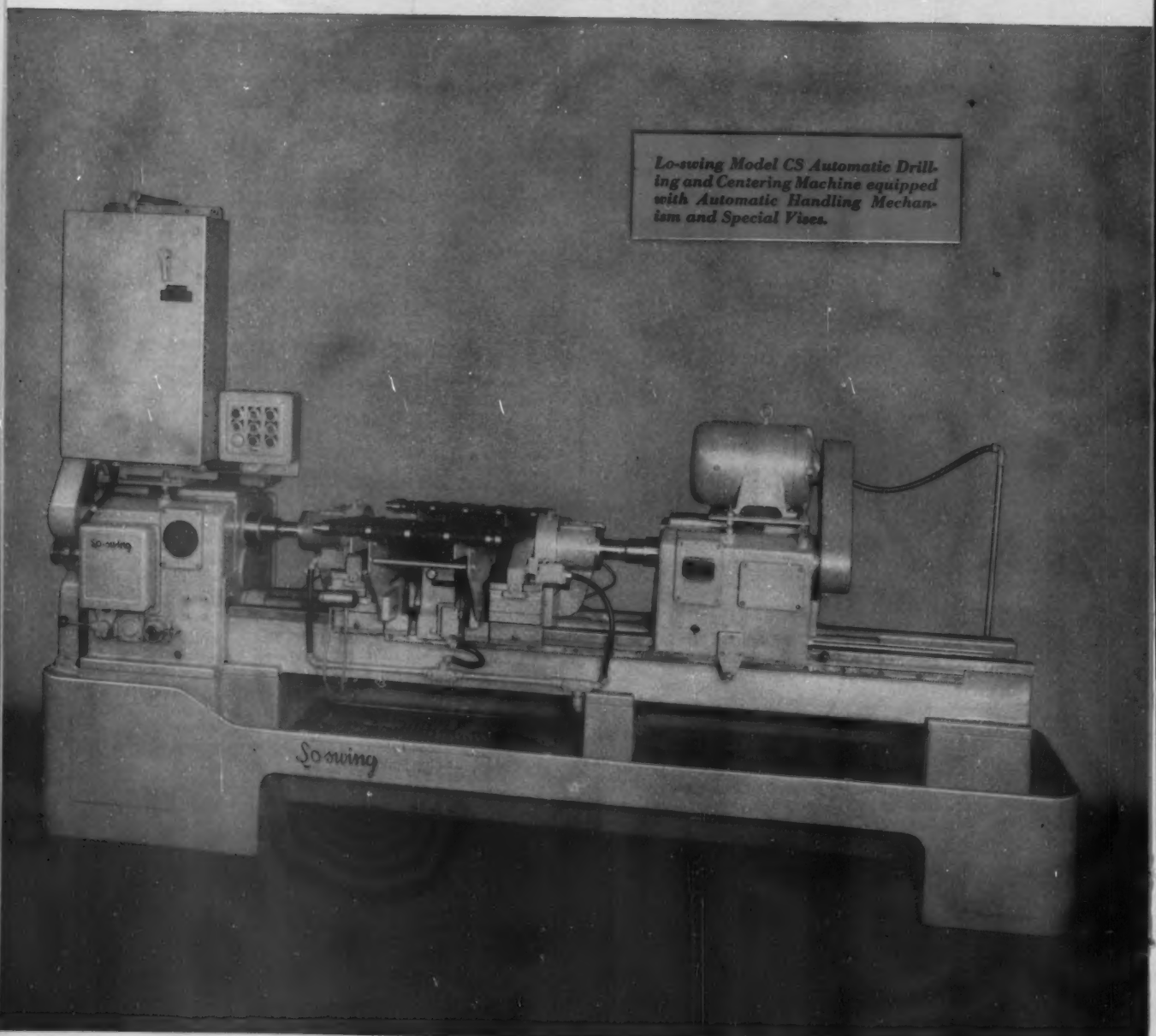
MACHINE OF

AUTOMATIC HANDLING CUTS CAMSHAFT CENTERING COSTS

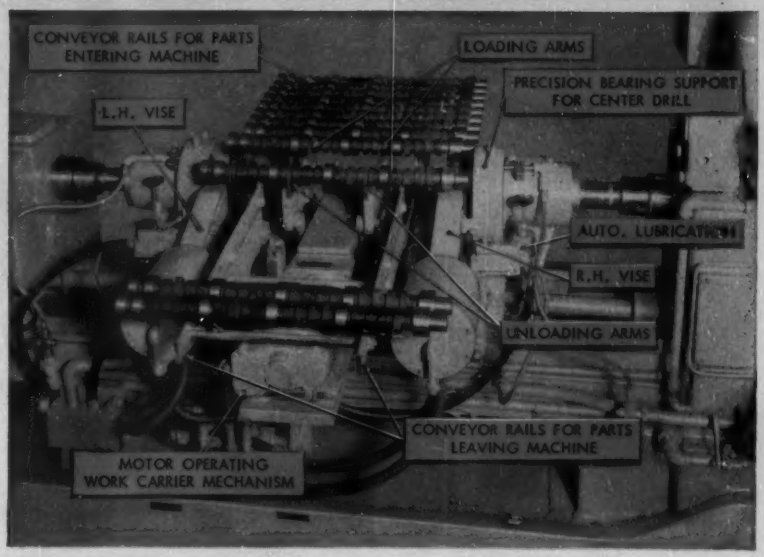


Lo-swing Model CS Automatic Drilling and Centering Machine equipped with Automatic Handling Mechanism and Special Vises.

PRODUCTION COSTS

THE MONTH

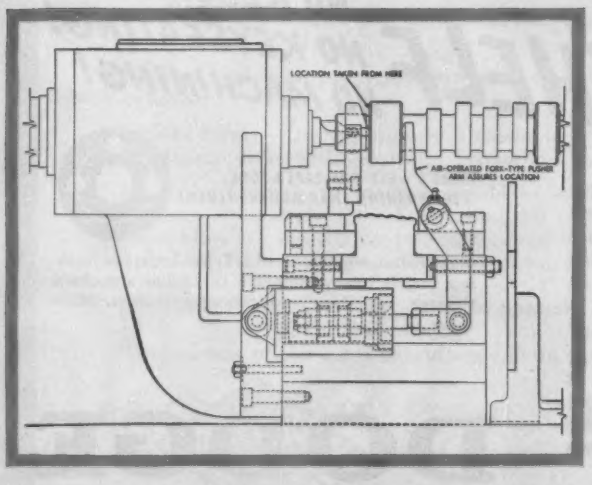
PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



PROBLEM: To automatically handle and center both ends of eight-cylinder camshafts.

SOLUTION: The standard *Lo-swing* Model CS Automatic Drilling and Centering Machine selected for this job was equipped with a special Automatic Handling Mechanism and special vises. The close-up illustration provides a rear view of the vises, loading and unloading arms, and rails which guide the camshaft through the machine.

The camshafts arrive at the machine from the previous operation by conveyor and roll down to a fixed stop on the loading rails. At the end of the machine cycle, the center drills retract and the vises open, allowing the finished piece to drop into a stationary cradle, which is positioned slightly lower than the center line of the vise jaws. An electrical contact then starts the work carrier motor, imparting a rotating movement to the work carrier arms which handle a rough and finished piece simultaneously.



The unloading arms remove the finished piece, depositing it on the conveyor rails leaving the machine, while the loader arms, in their trajectory, pick up a rough part and lower it into the vise jaws where it is automatically clamped in position. The machine starting clutch is then automatically engaged and the part centered, which completes the cycle. The entire operation is automatic, no operator being required.

The close-up illustration shows a finished part being removed from the vises and a rough part just being lowered into the vise. The line drawing shows the details of the automatic positioning stop attached to the left hand vise.

Seneca Falls engineers are at your disposal for solving your AUTOMATION problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

ARE LOWER WITH *Lo-swing*

TAPER-LOCK

A PATENTED PRODUCT OF DODGE

—OFF THE SHELF

NO REBORING!
NO KEYSEATING!
NO MACHINING!

Ready for the shaft, with no costly, time-consuming operations to make them fit. That's the big news about Dodge Taper-Lock Sprockets. Taper-Lock grips the shaft with the firmness of a shrunk-on fit, yet comes off easily. Bushings may be re-used. They come in sizes to meet most every application.

Taper-Lock Sprockets are available from Distributors' stocks in a complete range of B-type steel sprockets—½" through 2" pitch. Dodge quality Roller Chain is packaged in 10-foot lengths—also available in 50-foot and 100-foot reels. Save time—save money—keep production rolling—get Dodge Taper-Lock Sprockets and Roller Chain from your Dodge Distributor.

DODGE MANUFACTURING CORPORATION, 100 Union St., Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor, for valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

THERE'S ONLY ONE TAPER-LOCK, THE BUSHING THAT MOUNTS FLUSH!

Standardize, economize with Taper-Lock, the bushing that is interchangeable in Dodge sprockets; sheaves, couplings and conveyor pulleys. *More than 2,000,000 in use!*

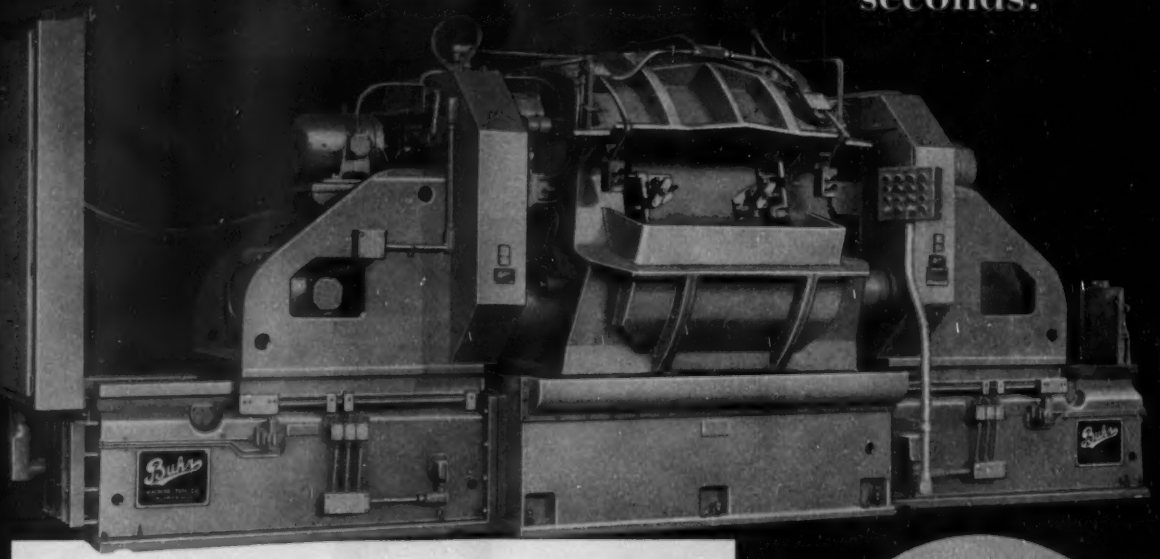
DODGE

of Mishawaka, Ind.

Buhr

SPECIAL...

Drills, chamfers and taps two rear axle drive shafts every 22 seconds!



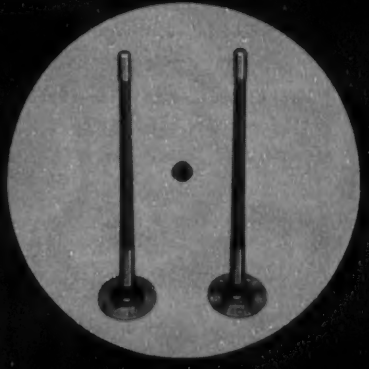
This Trunnion-Type Buhr Special drills, chamfers (both sides of holes) and taps 328 pieces an hour at 100% efficiency.

Two parts are loaded per fixture on this 6-station, 2-way Buhr Special.

Hydraulic clamping-and-unclamping is completely automatic.

Cluster heads — incorporated in a master gear box — are featured, as with all Buhr Trunnion-Type Machines.

On Buhr Specials, all parts are held to tolerances and are completely interchangeable. All component assemblies are located by precision-bored dowels. These Standard Buhr Features assure precision alignment!



See the complete range of Buhr Specials. Send for catalog or let one of our sales executives call on you.

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MULTIPLE-SPINDLE HIGH PRODUCTION MACHINERY

Just imagine drill heads you could anchor in AIR!

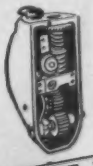
Think of the production possibilities . . . the tremendous time and cost savings . . . being able to locate spindles quickly in mid-air, at any angle, in any combination . . . being able to drill or tap any number of holes, simultaneously or in sequence, automatically or manually.

A startling concept? Using MAGNA DRILL, you can apply it right now in your own plant. Not only for special drilling and tapping jobs, but for standard operations as well.

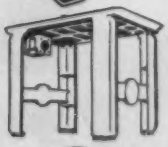
For with MAGNA DRILL, you build the machine around the part—just as if you were anchoring the components in air instead of to the rigid steel columns that provide complete freedom of setup.

Interested? Then let us send you details, specifications and prices. Also application sheets showing how other manufacturers are making profitable use of MAGNA DRILL—complete with cost breakdowns. Simply mail the coupon.

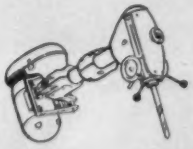
1001 QUICK SETUPS POSSIBLE WITH MAGNA DRILL MODULAR COMPONENTS



POWER FEED (Mechanical Type). Quickly attached. Feed rates .003" to .012" per revolution. Solenoid engage. Spring return. Automatic cycling. $105*.



TABLES AND LEGS. Drilled and tapped for mounting bases horizontally or vertically. Tables may be ganged. Single table, 24"x 20," $185*. Double, 24" x 40," $235*.



DRILL HEADS. Individually powered. Fully adjustable. Right or left hand manual feed. Choice of spindles. Price complete, less motor, $285*.

COLUMNS AND BASES. Heavy ⅜" walled tubes. 3½" O.D. Precision ground. Angle indexed. Bases are line-bored cast iron. $48*.

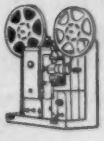
LEAD SCREW TAPPER. Replaces standard quill in 10 minutes. Includes reversing starter and controls, limit switch control plate, all wiring. $260*.

*F.O.B. your plant.

MAGNA ENGINEERING CORPORATION, *Dept. 273-L, at factory nearest you*
12819 Coit Road, Cleveland 8, Ohio, OR Menlo Park, California

☐ I'm interested. Send me specifications, prices and application sheets for MAGNA DRILL.
☐ Would like to arrange a showing of the MAGNA DRILL film on or about _____ (date).

Name _____
Position _____
Company _____
Address _____



SEE MAGNA DRILL IN ACTION ON FILM!

Now you can see the full, dramatic, cost-cutting possibilities of MAGNA DRILL right in your own plant. A 20-minute, 16mm sound film is available for showing to interested groups wherever they may be located. Just address your request to Magna Engineering Corporation, Menlo Park, California. We'll make all the arrangements. This is one movie you won't want to miss!

LEADING THE INDUSTRY IN DESIGN...

NO MARKING . . . NO SCRATCHING
NO UPSET EDGES . . .

THE *Etna* METHOD
FOR SMOOTH, WELL FORMED
STEEL TUBING

Closeup showing the Roll Cluster Unit Exclusive with ETNA Mills

Exclusive with Etna is the cluster unit. This unit progressively rolls the tube into shape without excessive stretching of the edges, thereby eliminating the "buckling" experienced with ordinary tube mills. Etna machines are not forming mills, they are designed for one purpose only . . . to make clear, well formed carbon and stainless steel tubing with no marking, no scratching, no upset edges. Write for complete details.

The ETNA 4KU Mill

Abbey **ETNA** *Company*

3404 MAPLEWOOD AVE., TOLEDO 10, OHIO

How To Make One Machine Equal Two!

KNIGHT'S NO. 50

PRECISION BORING & VERTICAL MILLING MACHINE

SPECIFICATIONS

- Table travel—Longitudinal 28"; cross 18"
- Vertical capacity—28"
- Table feeds—Dial type, 16
- Table feeds—per minute, 5/16" to 20"
- Table rapid traverse—both directions, 100"
- Spindle speeds, 16—40 to 2000 R.P.M.
- Boring feeds—infinitely variable, .0000"-.010"
- Horsepower, 7½
- Weight, 8100 Lbs.

By doing both milling and boring operation that ordinarily require 2 or more single-purpose machines, ***work transfers are eliminated,*** and ***setup time is cut to half or less.*** ***Exceptional working capacity*** is provided by unusual cross table travel and vertical capacity. Check the specifications at left.

Power to handle any job—rugged strength and rigidity —easy and convenient operation —these are only a few of the many other advantages incorporated in the Knight No. 50. Get ***all*** the details about this remarkable time-saver and profit-maker. ***Mail the coupon today.***

KNIGHT VERSATILE MILLERS ACCURATE · RIGID

ATTACH TO COMPANY LETTERHEAD

W. B. KNIGHT MACHINERY CO.
3920 W. PINE BLVD. • ST. LOUIS 8, MO.

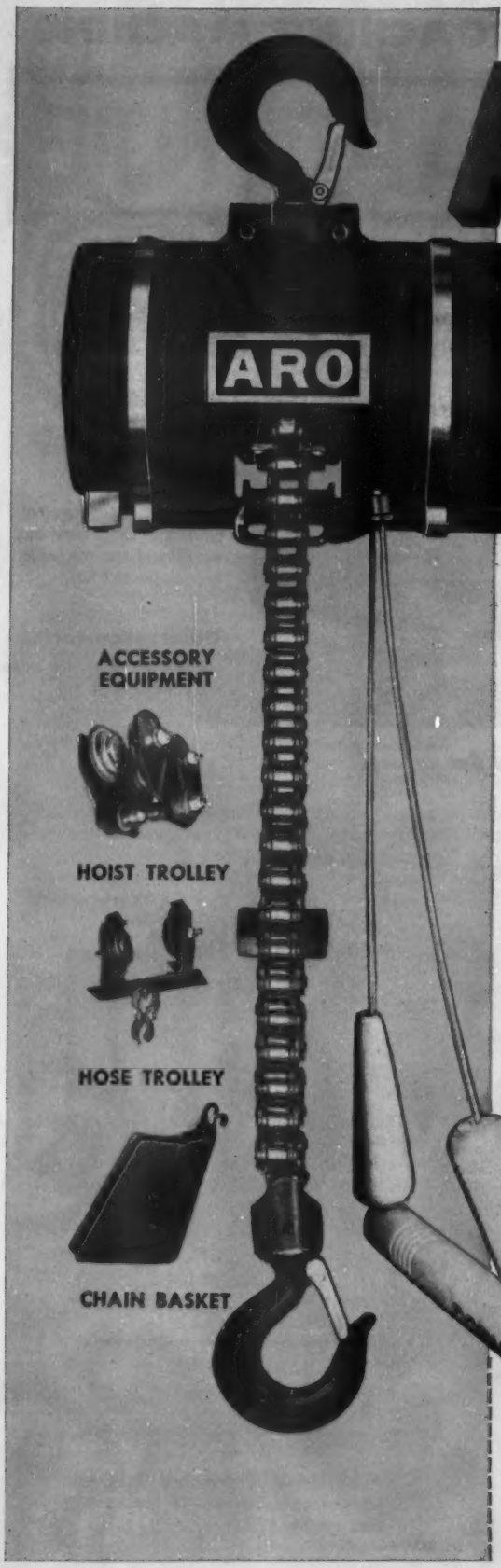
Please send catalog on No. 50 and other Knight Milling machines.

Name.....

Title.....

☐ Send information on Knight's 20" and 42" Rotary Tables.

W. B. KNIGHT MACHINERY CO.
3920 W. PINE BLVD. • ST. LOUIS 8, MO.



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VARIABLE SPEED AIR HOIST

Faster... Quieter... wide speed range, 3 sizes.

300 lb.—lift rate 75 ft. per min.
500 lb.—60 ft. per min.
1000 lb.—40 ft. per min.

Smaller... one man can easily install.

Safer... no spark hazard . . . betters all safety requirements.

More Useful... saves time and labor for shipping docks . . . heat treating departments . . . refineries, chemical plants and plating departments . . . machine shops and foundries . . . appliance, furniture, textile, automobile and aircraft assembly lines . . . stock rooms.

SEE YOUR ARO DISTRIBUTOR

The Aro Equipment Corporation, Bryan, Ohio
Offices in All Principal Cities
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ARO AIR HOIST
Also . . . Air Tools . . . Lubricating Equipment . . . Aircraft Products . . . Grease Fittings

The Aro Equipment Corporation, Bryan, Ohio
Please send full details on the new ARO Air Hoist, without obligation.

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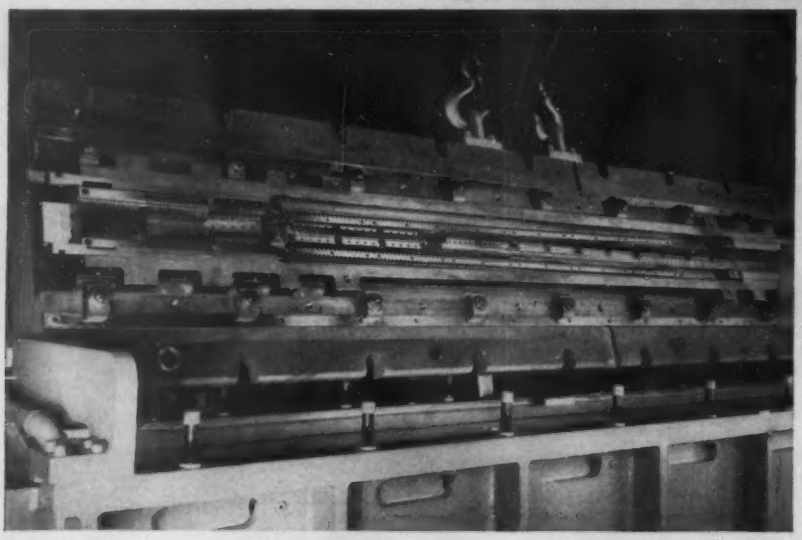
Company_____
Street_____
City_____ State_____

Here's the exciting story about a **BROACHING MACHINE**

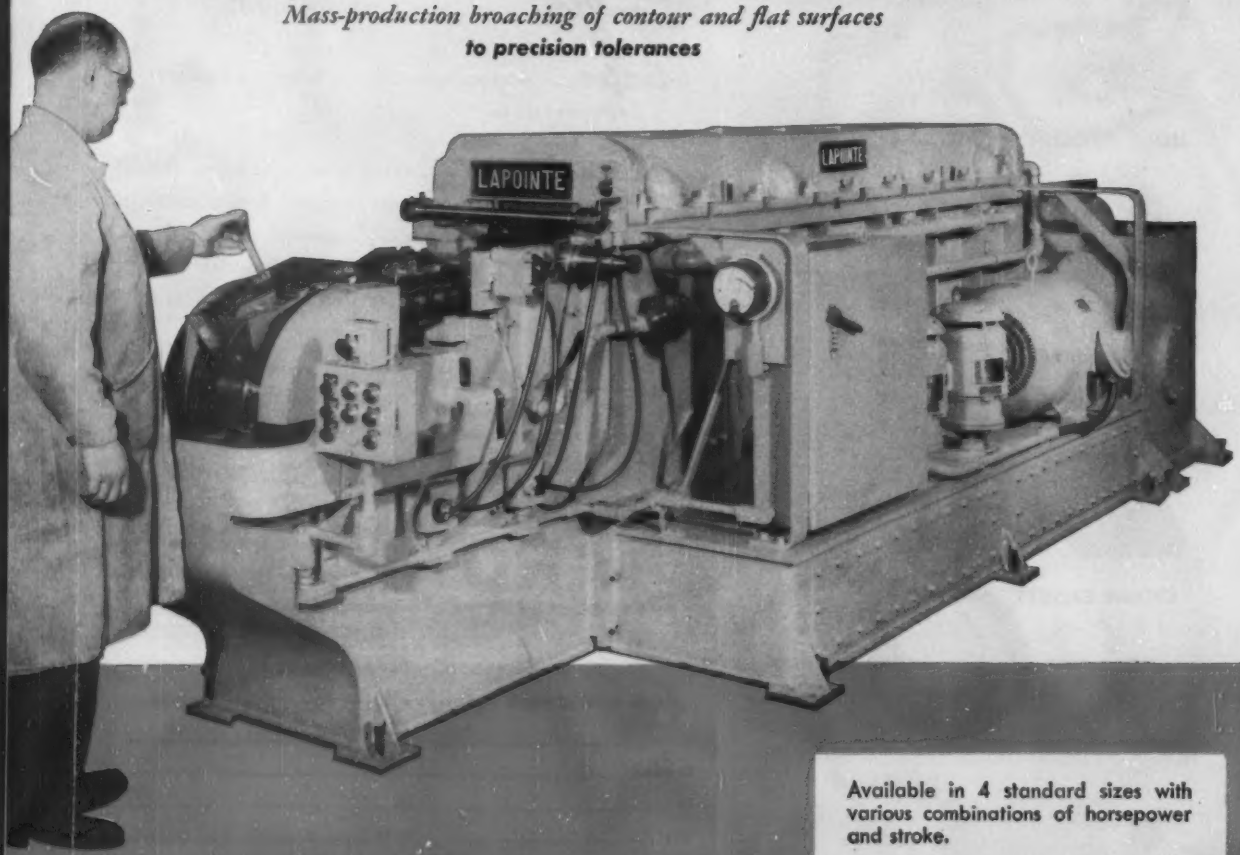
the LAPOINTE



THE BONNET,
or broach-carrying cover, is hinged to the frame and accommodates the main broach assemblies.

Observation Ports
enable the operator to see the condition of the broaches in action.

Mass-production broaching of contour and flat surfaces
to precision tolerances



Available in 4 standard sizes with various combinations of horsepower and stroke.

that DOESN'T STOP!

CONTINUOUS BROACHING MACHINE

RUNS ALL THE TIME

. . . you don't stop it to index
. . . you don't stop it to feed
. . . you don't stop it at all
(it's the nearest thing to perpetual motion!)

THE PARTS MOVE — NOT THE BROACH!

A powerful, matched-twin-chain drive is fitted with a series of individual fixtures (*designed by Lapointe*) that are completely automatic: self-operating, self-locating, self-clamping, and self-releasing. The operator merely drops the parts into the work nests.

FABULOUS PRODUCTION IS POSSIBLE

For instance, production of more than 1400 automotive connecting rods per hour has been maintained, broaching the sides, joint face, and half-round. 1400 . . . 1700 . . . 2000 parts per hour can be broached under full automation, with the optional hopper feed. What can this mean *for you*, on parts that you are *not now broaching*? Here is *precision* with *production*, and the great advantage of *machined surfaces!*

• • • •

Exceptionally heavy and rigid design assures smooth operation, long tool life, and excellent broaching finish. Completely fool-proof, the machine will stop automatically if parts are incorrectly positioned in manual loading.

FEATURES

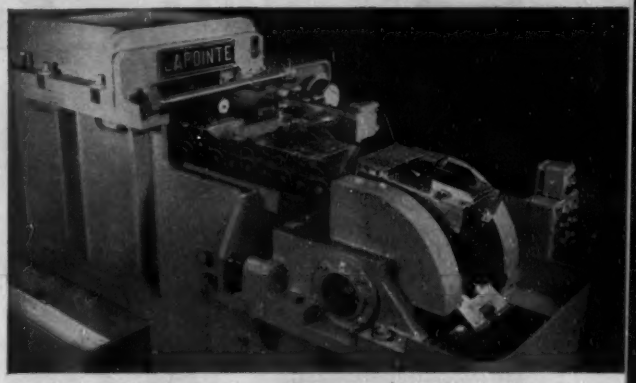
Engineered for ease of loading.

Broached part automatically releases at rear of machine onto suitable conveyor.

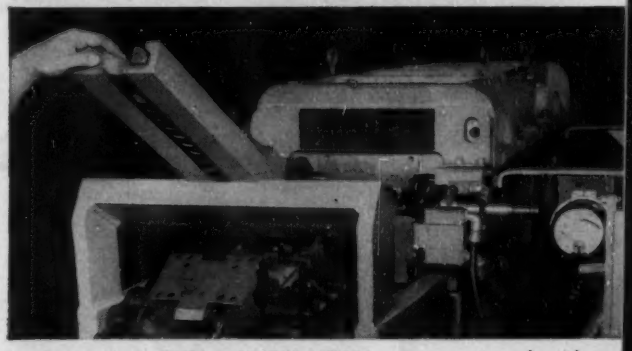
Multiple speeds. Changes in pick-off gears can easily and quickly be made.

Plus: Electric brake, for instant stopping; segmented sprocket, for simplified maintenance; two individual coolant pumps, for dependable flow; shear pin coupling, in convenient location.

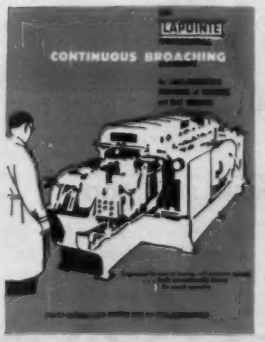
LAPOINTE does the whole job! We assume 100% responsibility because we build the machines, tools, and fixtures!



Front of machine, showing safety stop (the round white disc under Lapointe name-plate.) This safety stop assures positive positioning of parts in fixture. Note accessible chip trough.



Lends itself to **FULL AUTOMATION** when equipped with hopper feed.

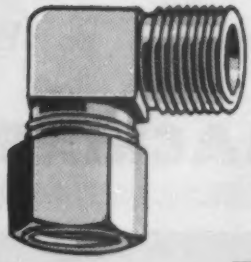


Get precision results at reduced costs!

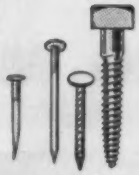
Every plant that is now mass-producing parts should investigate the Lapointe Continuous Broaching Machine with its many superior advantages. Send for descriptive bulletin CH-2

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

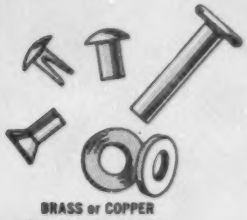


INDUSTRIAL and AUTOMOTIVE FITTINGS



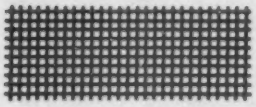
COPPER NAILS and TACKS
BRASS LAG and CAP SCREWS

BRASS or BRONZE BOLTS and NUTS

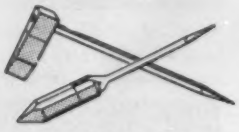


BRASS or COPPER RIVETS and WASHERS

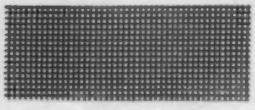
BRASS, COPPER, BRONZE COTTER PINS



INDUSTRIAL WIRE CLOTH



SOLDERING COPPERS



BRASS STRAINER CLOTH

COPPER ANODES

BRASS or BRONZE WOOD and MACHINE SCREWS

BRASS ESCUTCHEON PINS

SOLID or CORED BEARING BRONZE

CHASE NOW SELLS STAINLESS STEEL, TOO!

Need anything here?

Chase *has* it–in wide variety. You can be sure of getting fast service and the finest in brass and copper miscellaneous items–when you call Chase. Your nearest Chase Warehouse is listed below.

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FREE CHASE MOVIE

See "The Science of Making Brass," prize-winning documentary film. Now available on request to metal-working industries, technical associations, schools. Write any Chase office listed below.

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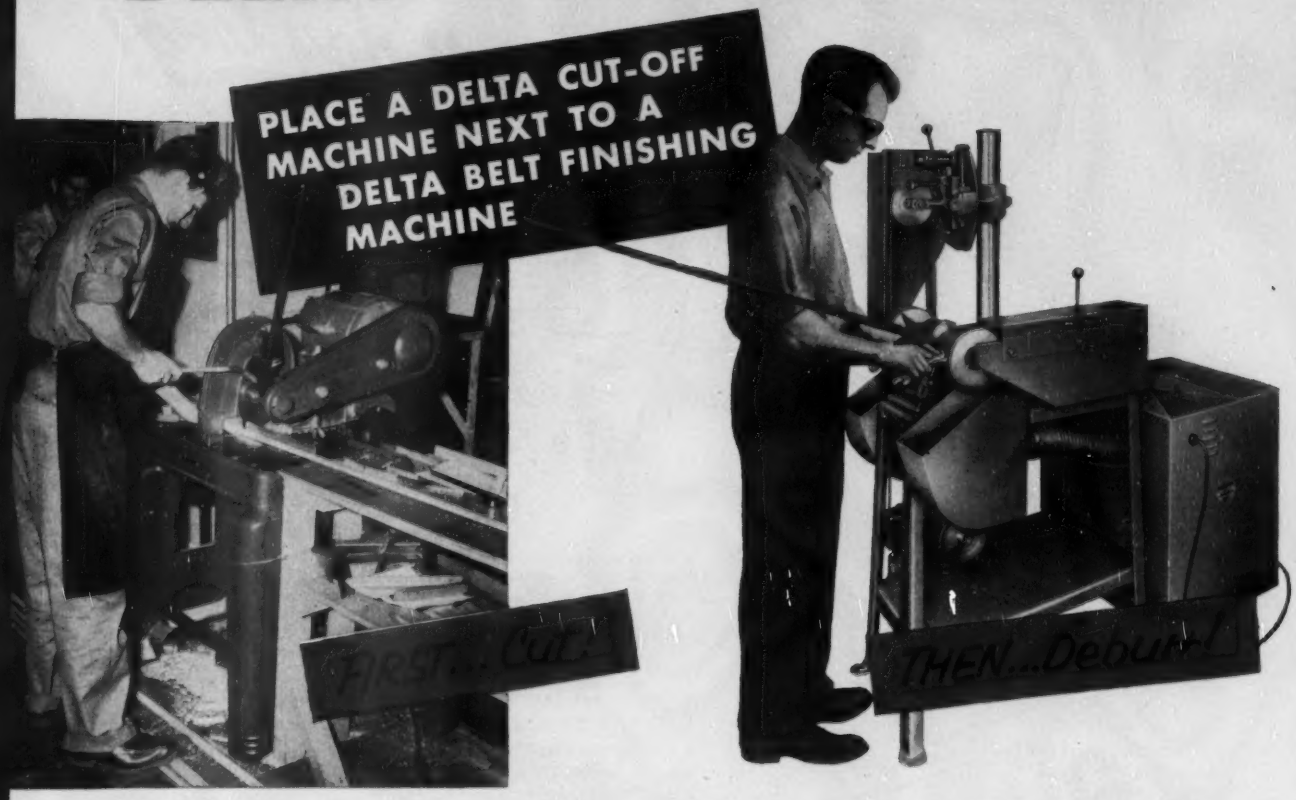
Baltimore	Cleveland	Houston	Milwaukee	New York	Rochester†	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)

Reduce Cut-Off and Finishing Costs

WITH THIS LOW-COST HIGH-SPEED DELTA PRODUCTION TEAM!



FIRST—make the cut in one fast, easy motion on the Rockwell-built DELTA Cut-Off Machine. Smooth, clean cuts on steel or non-ferrous metals keep burrs to a minimum—speed production—greatly reduce per unit costs. The versatile DELTA Cutoff Machine saves money on hundreds of jobs presently handled manually, or on far costlier equipment. It will cut steel tubing up to 1¼", and non-ferrous metals up to 2" diameter or equivalent, with absolute accuracy.

SECOND—without lost time or motion—deburr each piece with a DELTA Belt Finishing Machine. This fast, versatile machine is a dependable production tool. A real time-saver, it is ideal for removal of casting headers as well as fast, on-the-spot deburring and finishing. It can be assembled into many combinations to fit your requirements, yet its low initial cost, rugged construction and complete portability enable you to cut costs on hundreds of operations in your shop.

Completely portable, these two Rockwell-built DELTA machines can be quickly shifted to any part of your shop, set up as a team, put to work cutting and finishing in a fast, cost-cutting sequence. You take the tools to the work, eliminating cumbersome, time-consuming stock handling. Your machine operators can cut and finish pieces while their machines are cycling automatically.

There are literally hundreds of ways in which these and other accurate, portable, low-cost DELTA tools can save money in your plant. Get in touch with your DELTA Dealer today—he's listed in your classified directory under "Tools" or "Machinery."

DELTA DUST COLLECTOR

The DELTA Dust Collector (shown above with the DELTA Belt Finishing Machine) is a self-contained, low-cost, portable unit, that can be attached to all types of abrasive machines. A powerful fan sucks both fine and heavy dust and small particles through a permanent, perfected air filter. The larger particles fall into a pan and are easily removed. Workers' health is protected, and harmful dust is kept away from machinery.

Delta Power Tool Division,
Rockwell Manufacturing Company
618J North Lexington Avenue, Pittsburgh 8, Pa.

DELTA QUALITY MAKES THE DIFFERENCE DELTA ROCKWELL

DELTA QUALITY POWER TOOLS
Another Product by Rockwell

KELLER TOOLS "button up"

461 assemblies an hour

all day long!

Two workers make a team in assembling parts for automobile horns. Above, the screws are started which attach assemblies of stacked parts to the horn yoke. At left, the two screws are run down and tightened. Both workers use Keller Pneumatic Screw Drivers, and together they assemble at the rate of 461 units per hour.

Sustained high production rates result from providing workers with easy-to-handle Keller Air Tools engineered to the job. Waste motions are eliminated, fatigue is reduced, and production speeds are maintained hour after hour.

Keller application engineers, located in principal cities from coast to coast, have the training, know-how, and experience to select the correct tool for the job. They have a much wider selection of attachments, fittings, pickups, and finders from which to choose... plus the backing of design engineers ready and able to provide special adaptations or special tools if needed.

Have you talked to the Keller man, lately?

These are a few of the many Keller Screw Drivers:

KELLER

Pneumatic Tools

KELLER TOOL CO.

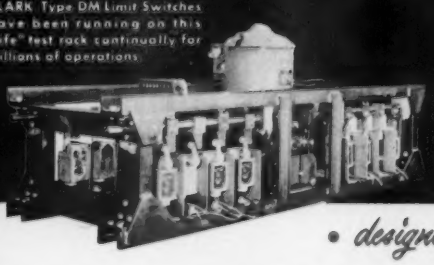
1303 Fulton Street
Grand Haven, Michigan

NEW

CLARK

Type DM

MACHINE LIMIT SWITCH



CLARK Type DM Limit Switches have been running on this "life" test rack continually for millions of operations.

• *designed and built for dependability and longer life* •

Our design engineers were given the assignment of developing a new heavy-duty machine limit switch to meet the exacting needs of modern industry. Primary requisites were dependability, accuracy, durability and versatility. They created a design that is rugged, simple and 100% functional. They selected materials for the working components that hold up indefinitely under the most severe punishment. They employed sound, mechanical principles to provide positive, accurate, trouble-free operation, and added features to make the switch as nearly "fail-safe" as possible.

Pilot models were subjected to severe breakdown tests, and changes made as indicated. When our high standards for performance and durability were finally met, the initial production run was made. The first production units were placed on the test rack illustrated, and have been operating continuously ever since.

THE CLARK CONTROLLER CO.

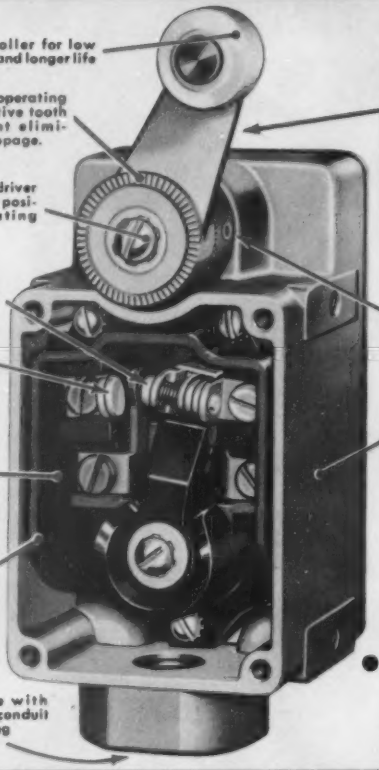
ENGINEERED ELECTRICAL CONTROL • 1146 EAST 152ND STREET, CLEVELAND 10, OHIO

See other side for further details

CLARK *Type DM* LIMIT SWITCH

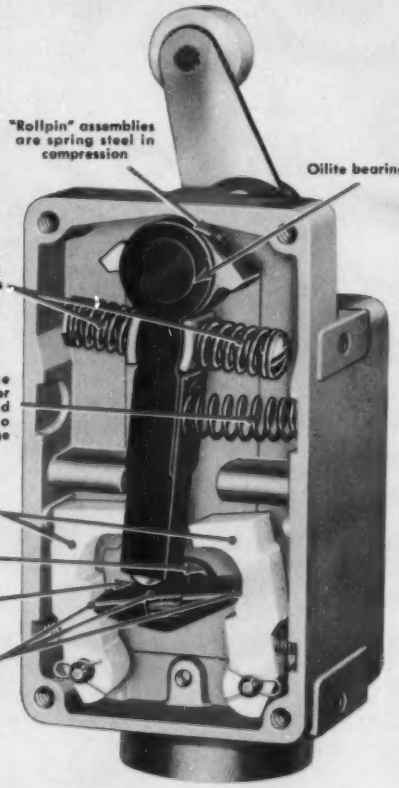
built for RUGGED SERVICE

VERSATILITY • LONG LIFE • ACCURACY


Nylon roller for low friction and longer life
Reversible operating lever—positive tooth engagement eliminates slippage.
Simple screw driver adjustment for position of operating lever
Quick, positive-latch, make and break action
Contacts of heavy "fine" silver
Ample space for 4 wires with STAKON connectors
Heavy one-piece molded insulating block supports all stationary contacts and terminals and surrounds all live parts
Available with ½" or ¾" conduit opening
"Rollpin" assemblies are spring steel in compression
NEMA Type 5 dust-tight, oil-tight enclosure
• Areas subjected to arc deterioration protected with glass-melamine plates
• All springs are in compression
• Electrical and mechanical sides of switch are completely isolated

OPERATING LEVERS
8 TYPES AVAILABLE FROM STOCK

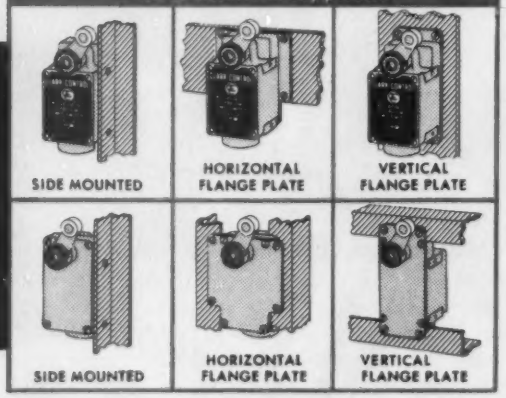
CLARK Type DM LIMIT SWITCHES are simply built, with a minimum number of parts. They are designed for one purpose: to provide dependable, accurate, trouble-free operation for a long life. All latch and trip-bearing surfaces are nylon to steel for minimum wear. All springs are in compression for greatest safety—they cannot be overloaded.


"Rollpin" assemblies are spring steel in compression
Oilite bearings
Double concentric over-travel springs in compression for "fail-safe" operation
Return spring can be used on either side or removed for maintained contact—requires no tools to remove, change or replace
Nylon Latches with exceptional wearing qualities
Oilite bearings
Nylon spring-loaded contact operator
All latch and trip bearing surfaces are nylon to steel

REGULAR AND REVERSE LEVER TYPES
—can be mounted in any position

REGULAR MOUNTING TYPES

REVERSE LEVER MOUNTING TYPES



Six styles of back covers or mounting plates are available for an infinite variety of mounting arrangements.

Insist on CLARK Type DM Limit Switches for more dependable, longer life operation on all your new machines and for replacement of unreliable or worn out switches on equipment now in use.

THE CLARK CONTROLLER COMPANY
1146 EAST 152nd STREET • CLEVELAND 10, OHIO

Please send me Bulletin 102 DM describing the new CLARK Type DM Limit Switch.

NAME_____

TYPE OF BUSINESS_____

COMPANY_____

ADDRESS_____

CITY AND STATE_____

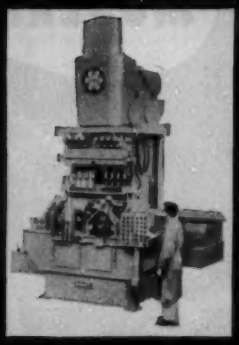
Send for 4-page descriptive bulletin giving full specifications and ratings. Use this coupon.

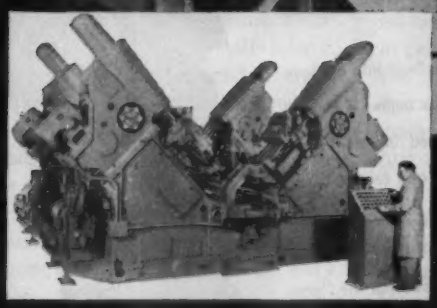
FOR

Production • Accuracy • Economy

V-8 Cylinder Blocks are MICROHONED Automatically on NEW Model 420 Hydrohoners ☆

Specifications of this model are included in our general catalog—obtainable at the offices listed below.





This multiple-spindle, heavy-duty model is designed to fit any type of production line. Examples of its adaptability: above, two four-spindle machines with tip-up fixtures; left, V-type; upper right, eight spindle vertical.

1929 • 1954 — 25TH YEAR OF DEVELOPMENT — PRECISION PRODUCTION THROUGH MICROHONING — MICRO MATIC — TRADE MARK

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Hydraulic Controls • Diesel fuel injection equipment

5304

FORGET OLD NOTIONS about engine lathes . . .

MEET THE MODERN..

- A LATHE TO SPARK YOUR FANCY
- A LATHE TO WIN YOUR LOYALTY
- A LATHE TO MEET YOUR NEED

BOYE & EMMES

HEAVY DUTY ENGINE LATHE

LONG LIFE

SERIES BB

EIGHTEEN SPEEDS

The outstanding value which is built into all Boye & Emmes Long Life, Heavy Duty Engine Lathes is evident in the extra quality features discussed in this folder. Compare Boye & Emmes specifications and features. You will find shorter shafts, more rigidity, greater speed ranges, more compact design throughout. Put one to work in your production and watch it become the "preferred" turning tool among the men who judge by day-in day-out performance.

HEAVY DUTY LATHES SINCE 1895

THE STORY is told in detail in Boye & Emmes Bulletin No. BB531

WRITE FOR IT! . . . no charge . .

BOYÉ & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO
MACHINE TOOL CENTER of the WORLD

WHY IT PAYS TO BUY USS CARILLOY FC STEEL

"THIS FC STEEL cuts just like butter!" this machinist said. He finds that the free-cutting nature of Carilloy FC is especially helpful in producing intricate worm shafts. These shafts, which must be free of distortion and concentric from top to bottom, are made from USS Carilloy FC steel without heat treatment after machining.

Cuts costs 25% in heavy-duty gears and pinions!

• No heat treating, no grinding, no sand blasting after machining. Pittsburgh Gear Company, Neville Island, Pittsburgh, Pa., eliminated all three of these costly operations by switching from AISI 4140 to *pre-hardened, free-cutting* Carilloy FC steel. This was possible, because FC steel machines easily without distortion and requires no heat treatment after machining. It comes from the mill *ready to use.*

Carilloy FC helped this manufacturer to speed up production, too. He uses deeper feeds and faster cutting speeds than before, yet his tools last longer. All told, the change-over to Carilloy FC steel has lopped 25% off his production costs . . . at no loss in performance of the finished parts. His shafts, pinions, gears, and spacers, which are used in rugged industrial and mining machines, are just as strong and durable as they were before.

Carilloy FC steel is available annealed, or quenched and tempered to any hardness from 255 to 375 Brinell . . . with a tensile strength from 125,000 to 175,000 psi . . . in all standard bar forms and sizes. Ask the United States Steel Supply salesman about it. Or get in touch with our nearest warehouse.

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Use CLEVE-WELD Process Welded Rings

—all ready for finish machining!

AS COMPARED with other methods, this roll-and-weld process is able to produce preshaped, accurately dimensioned blanks that often do away with all rough machining and the expense of much excess metal. These blanks are stronger, too, because they have continuous grain flow throughout. Since they're practically free of subsurface defects, rejection of nearly completed parts is virtually eliminated.

Blanks of rectangular cross section, such as ring gear blanks and motor or generator shells made by the Cleve-Weld Process, are rolled from plain bar steel, then welded.

Send for our 28-page brochure describing the Cleve-Weld Process and illustrating our special facilities for serving you. And be sure to check with us on your needs for steel blanks from 6 to 48 inches in diameter and up to 2½ inches in thickness. Write THE CLEVELAND WELDING COMPANY, West 117th Street & Berea Road, Cleveland 7, Ohio. (Subsidiary of American Machine & Foundry Company, New York).

The CLEVE-WELD Process
for lower-cost circular steel parts

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EXTRA DURABILITY. With the greatest all-around ruggedness ever built into a trichlorethylene, *new* "Triclene" D has unsurpassed resistance to *all* major causes of solvent breakdown—heat, light, air, metal chlorides, and acidic materials—yet contains nothing to harm the most delicate metal surfaces.

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In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket. That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaminated fluid.

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As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

Send at once for details of Barrett Typhoon Washer

Barrett Centrifugal Washer —made in capacities from 13 to 38 cu. ft. per hour. Each size, depending on condition, will perform at the rate of 20 duty cycles per hour.

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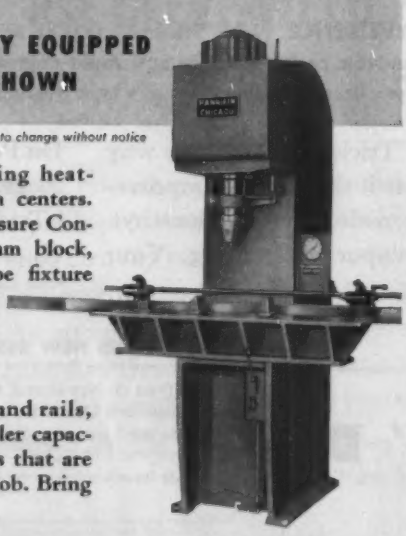
Price F.O.B. our press plant at St. Marys, Ohio, subject to change without notice



The ideal press for straightening heat-treated parts up to 60" between centers. Exclusive Hannifin Sensitive Pressure Control for speed and accuracy. Ram block, two table blocks and center-type fixture complete with rails included.

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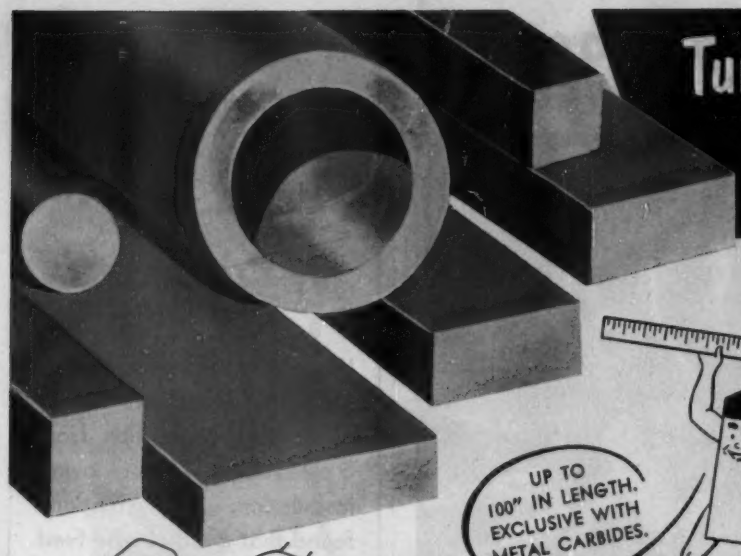
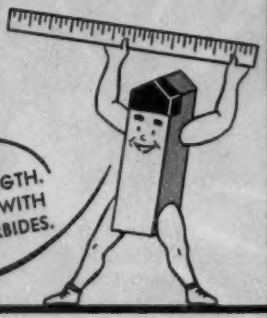
Tungsten Carbide Bar Stock





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Tubes and rods; and square and rectangular shapes up to ¾" are in stock. On any wear-resistant job, you save money by using Talide Bar Stock.

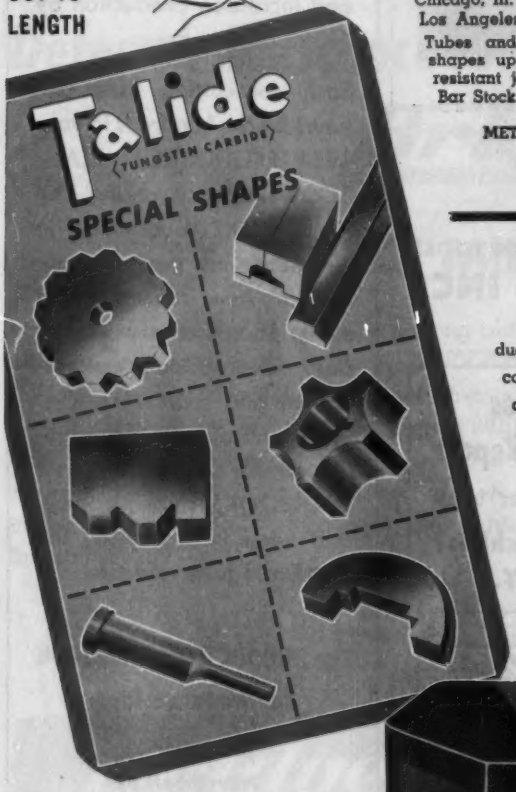
METAL CARBIDES CORPORATION
YOUNGSTOWN 7, OHIO

● Large Grinding Wheel Maker using Talide Bar Stock as core pins for forming bore of refractory wheels during pressing operation reports greater accuracy and concentricity maintained—with service life increased from 3 days to 90 days.

● A leading Electrical Equipment Manufacturer blanking .014" silicon steel sheets for transformers has reduced costs 40% by tipping cutting edges of shear blades with Talide Bar Stock. Cleaner cutting action obtained with edge burr eliminated.

● Leading Eastern Carbon Producer reports they save 30% on tooling costs finishing their own dies, punches and core pins from Talide Bar Stock. In addition, service life is increased 70 to 1 over steel die assemblies previously used.

● A Midwest Machine Tool Company has substituted grinding spindle sleeve bearings made from Talide Bar Stock with result that vibration and whip have been reduced, closer tolerance achieved, and improved finish obtained on parts ground.



Send for new 84-page Catalog 54-G or ask for sales engineer to call.

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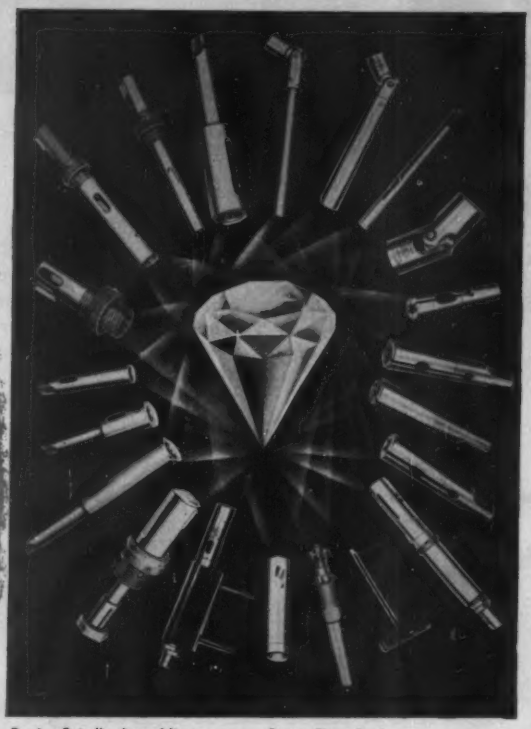

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Press Output Greatly Affected By Proper Feed

Use of a suitable feed is often the difference between run-of-the-mine production from a press and a real cost-saving installation. One company found that the dial-type feed was the answer to increasing output and cutting labor costs in making flashlight cases. It used two presses served by two men. Then it installed the new feed on one machine and increased production by 300% on that press.

Such cost-cutting facts are yours *by the hundreds* in your 1954 PRODUCTION PLANBOOK for Metalworking. The PLANBOOK, published in November as part of your regular *American Machinist* subscription, has a wealth of data about efficient modernization and replacement. If you aren't already thoroughly familiar with your new PLANBOOK, study it now, and keep it nearby all the time for regular reference.

The PRODUCTION PLANBOOK for Metalworking

is published every November by

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An improved vise of greater gripping power. Streamlined for appearance; rigid holding by means of large diameter screw; coolant trough. Two sizes: 5" x 3½" and 6" x 5" jaw openings
No. 2 BORING HEAD
Boring Tools and Holder provide means for boring holes up to 6" diameter. Available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.
RIGHT ANGLE ATTACHMENT
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Designed for milling and drilling at right angles; available for Master and 1 HP Bridgeport Heads.
RIGHT ANGLE ATTACHMENT
LIGHT DUTY
For right angle milling and drilling narrow, deep molds and cavities.

Defer obsolescence for many years to come... with

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▼ TURRET MILLING MACHINES ▼

Shops both large and small, by replacing old, inefficient machines with modern "BRIDGEPORT MILLERS" find prompt returns on their investment. Moderately priced, versatile, accurate "BRIDGEPORTS" put obsolescence far off into the distant future because they are away ahead of their time in convenience, long-lived economy and outstanding utility.

These universally accepted machines are kept constantly busy production-wise through their *exclusive method* of milling, drilling, boring and shaping, combined with ability to position the milling head at all angles over a wide area *without changing set up.*

Attachments are available (some of which are shown here) extending the utility of these machines of unprecedented popularity.

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Bridgeport MACHINES, INC.

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Manufacturers of High Speed Milling Attachments and Turret Milling Machines

GEAR COSTS ANALYZED

Every gear buyer will be interested in this eight page folder entitled "A Down-to-Earth Story of Precision Instrument Gear Costs."

Every element of gear cost is discussed. Each operation in the production of the four grades of "Commercial" and the three grades of "Precision" gears are evaluated in minutes of labor for direct cost comparison.

YOUR COPY IS READY WRITE FOR IT TODAY

6964

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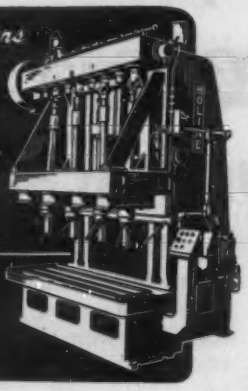

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No. HU68—Hydraulic rail feed universal joint type multiple spindle drilling machine.

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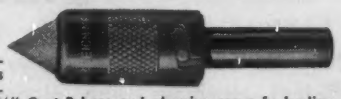
Abrasive Cen-R-Lap Tool



Saves time, eliminates diamond dressing. Cones changed in seconds. Available in 2 sizes, ¾" and ¼" Cent-R-Laps and abrasive cones in leading grits. Write for descriptive literature and prices.

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. . . for precision work

Arch Sub-Press

The cylindrical plungers in the Waltham Sub-Presses slide in babbitted bearings. This bearing is tapered on the outside and can be forced downwards, thus reducing the inside diameter to fit the plunger when the latter becomes worn through use. Exact alignment and constant precision can be maintained throughout the life of the die. Write for information about the nine sizes.

Overhang

WALTHAM MACHINE WORKS
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Precision gears go flying

The real-life counterpart of this imaginatively drawn gearbox has as many as 30 separate gears —most are precision ground by LYCOMING on

REISHAUER ZA GEAR GRINDERS

Single-thread grinding worm and spindle of the Reishauer ZA.

Auxiliary "nerves" of the mighty J-40 and J-47 jet engines, these precision gears transmit power to run fuel and oil pumps, generators, and other vital accessories. Lycoming, maker of this intricate gearbox, depends on Reishauer ZA gear grinders for precise, rapid production of gears.

Lycoming likes the way Reishauer consistently produces gears to extremely close tolerances at high production speeds. Furthermore, operators on the production line benefit from the simplicity and cleanliness of the machines' operation.

Lycoming is not alone in its respect for Reishauer grinders—these machines are widely used to grind spur and helical gears in the automotive and aircraft industries. Other users include machine tool builders, gear-jobbers, and instrument manufacturers.

In short, Reishauer ZA grinders are excellent machines. If you want proof, we'll be happy to supply it. Get in touch with us soon, won't you?

COSA — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

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The precision manufacture and quality control used in making Mac-it Screws provide users with high dimensional accuracy and uniformity. All Mac-it Screws in both coarse and fine threads are held to a class-3 fit.

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Mac-it heat-treatment is more than a mere case hardening or surface processing. The high quality of Mac-it Special Alloy Steel adapts it to heat-treatment that penetrates throughout the structure of the screw so that the center possesses the same sturdy toughness possessed by the outside. Proved formulas govern this process.

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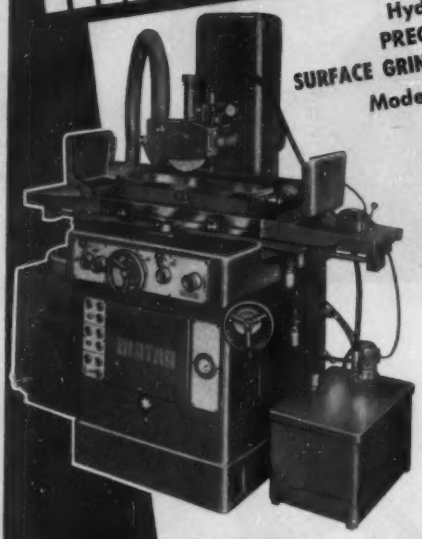
Hydraulic PRECISION SURFACE GRINDING MACHINE Model MF 6



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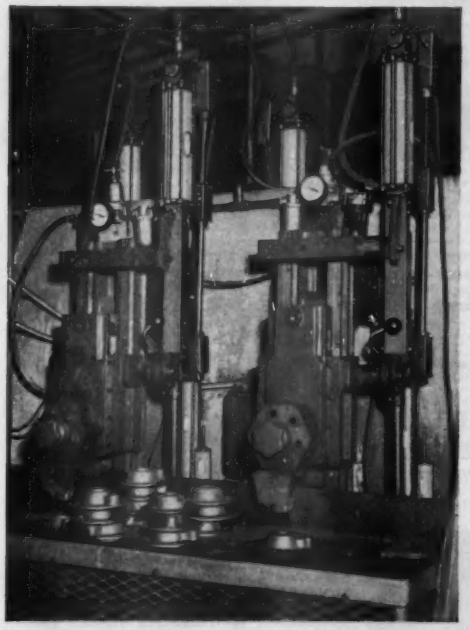
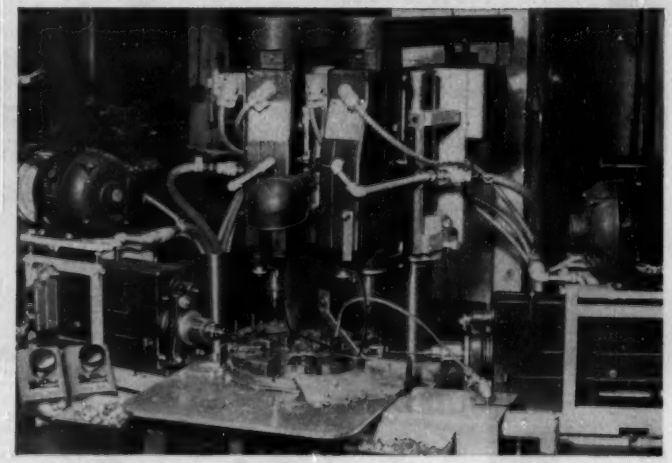
WITH THIS UNIQUE AIR MOTOR

This semi-automatic set-up at Eastman Manufacturing Co. doubled production and eliminated fatigue in milling bakelite magneto parts.



A simple installation cut lathe time on steel ordnance parts from 90 to 10 seconds per piece at Joseph Pickard's Sons of Philadelphia.

you can build cost-cutting special machines or modernize existing machines right in your own shop with your own personnel



This drilling machine, built by Horrocks-Ibbotson, turned out 1 year's production of their fishing reel pawl blocks in 3 months.

Even for short runs you'll find special machines built around this versatile power unit will pay off in a big way — in greatly lowered costs, in fewer rejects, in better product quality. No expensive engineering is needed. In fact, your local Bellows Field Engineer may have in his Foto-Facts File basic designs that can be readily adapted to your product and your production processes.

Your own tool room can build such special machines at decidedly low cost, and quickly. Often they pay for themselves with the first week's savings.

The Bellows Co.

IN CANADA: Bellows Pneumatic Devices of Canada, Ltd.
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Bulletin CL-50 tells the story of the Bellows Air Motor and the part it is playing in cutting manufacturing costs in hundreds of plants. Address: The Bellows Co., Dept. AM 954, Akron 9, Ohio.

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AUTOMATIC THREADING LATHE

. . . is so versatile
that hundreds of diameters and
lengths of threads
can be produced on it,
without limitations . . .

FASTER – ACCURATELY – AUTOMATICALLY!

It could be your solution to
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Machine Tool BUILDERS Since 1896

GRIND-O-FLEX

the new flexible

GRINDING WHEEL

★ Removes burrs, flash, tool marks from irregular surfaces
★ Will not "flat" or dig into contoured shapes
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★ Requires no special equipment, attaches to power tools
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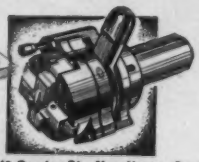

famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

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Special Machinery

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Model C 50 B

RANDALL and STICKNEY Dial Gauges and Indicators

are accurate, reliable and built to stand hard usage.

Model "C 50 B" has a 2½" overall diameter, balanced dial 0-25-0 with .0005" graduations, ½" range and movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

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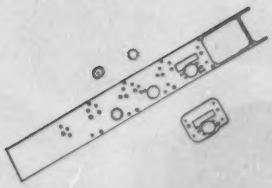
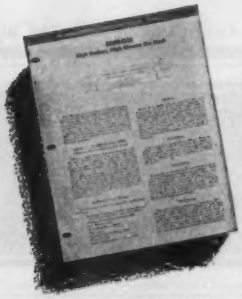


This HURON Lamination Die Gave Initial Run of 426,000!



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This concise four-page folder gives all needed handling and shop treatment details on Huron. Included is certified laboratory information on physical characteristics, and complete data on forging, annealing, hardening, tempering, etc. *Ask for your copy.*

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LUDLUM HURON high-carbon, high-chrome die steel was the material used in this motor lamination die. Here was the result when the die was run on a 45-ton Bliss press at 210 strokes a minute:

1. Initial run was 426,000 pieces
2. Average run since has been 250,000 pieces
3. Although burr tolerance is .003", grinding of punch and die between runs has not exceeded .008"

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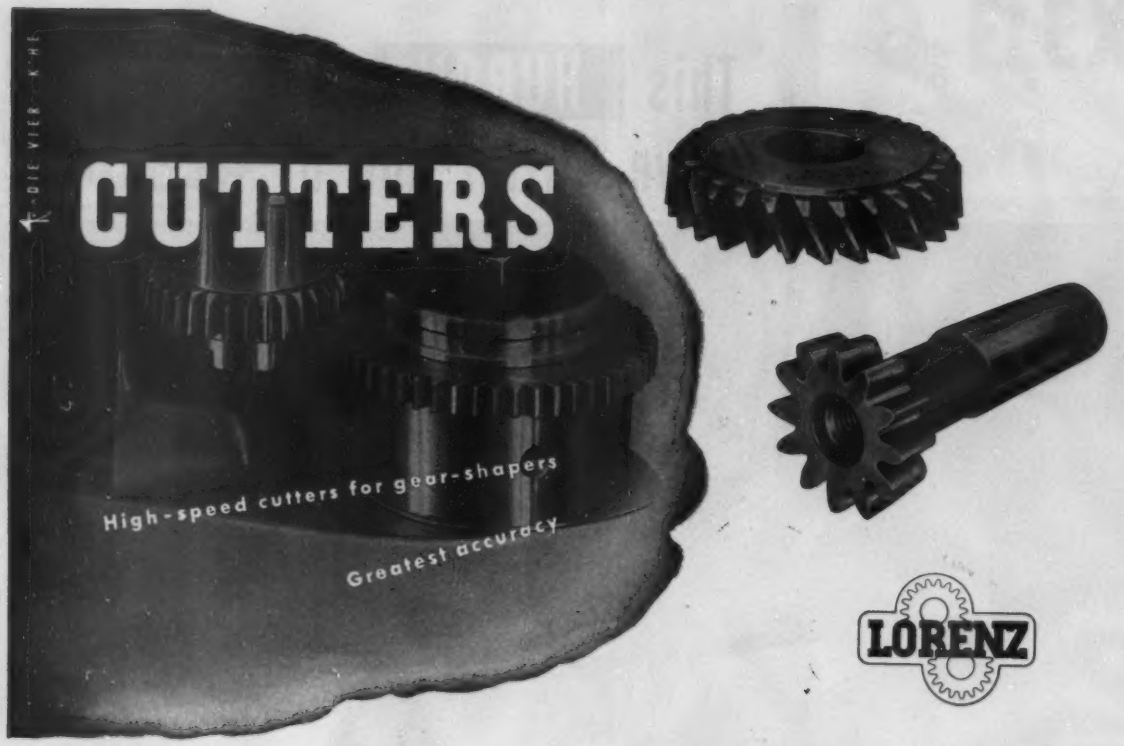

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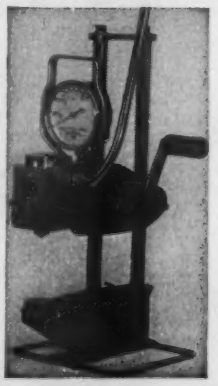

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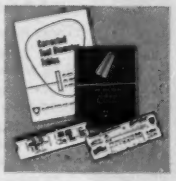

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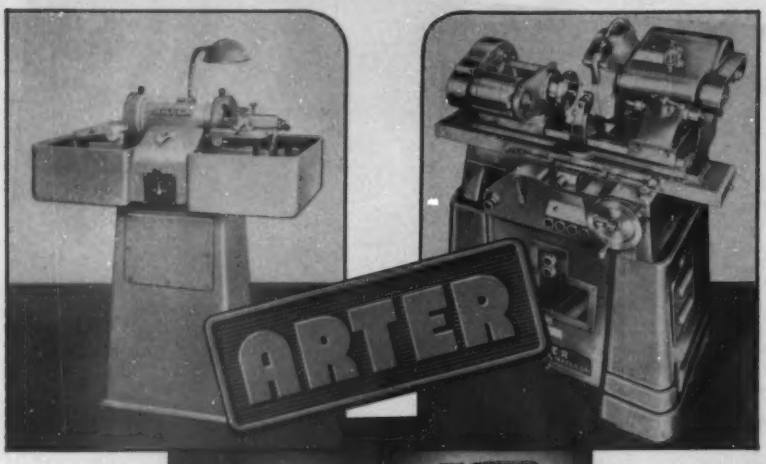

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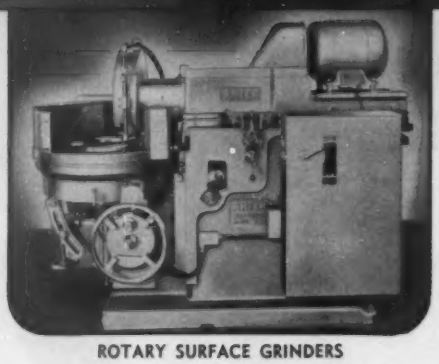

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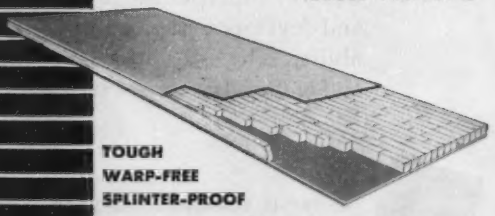

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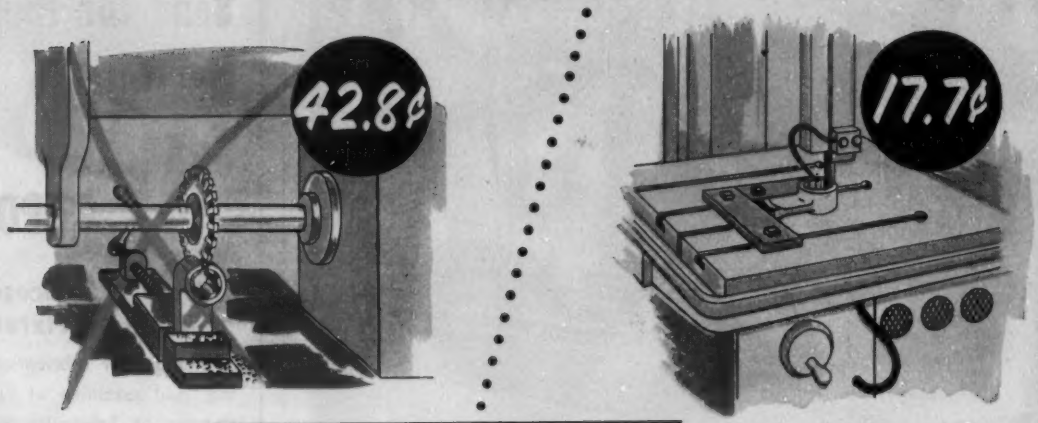

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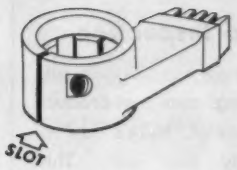

View of completed part on which slotting cost was reduced from 42.8¢ to 17.7¢.

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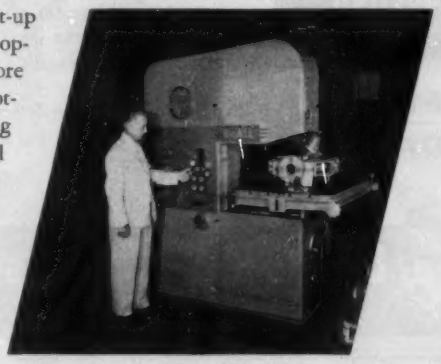

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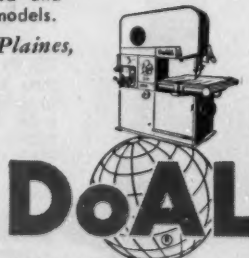

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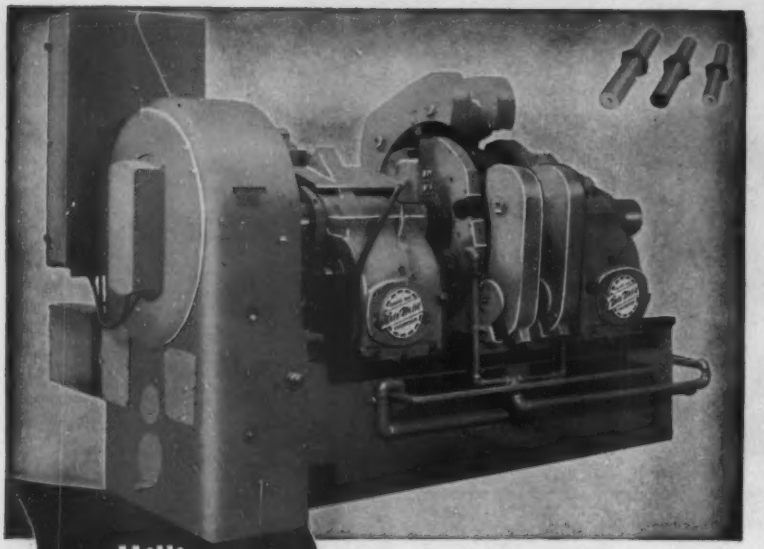

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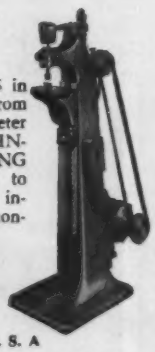

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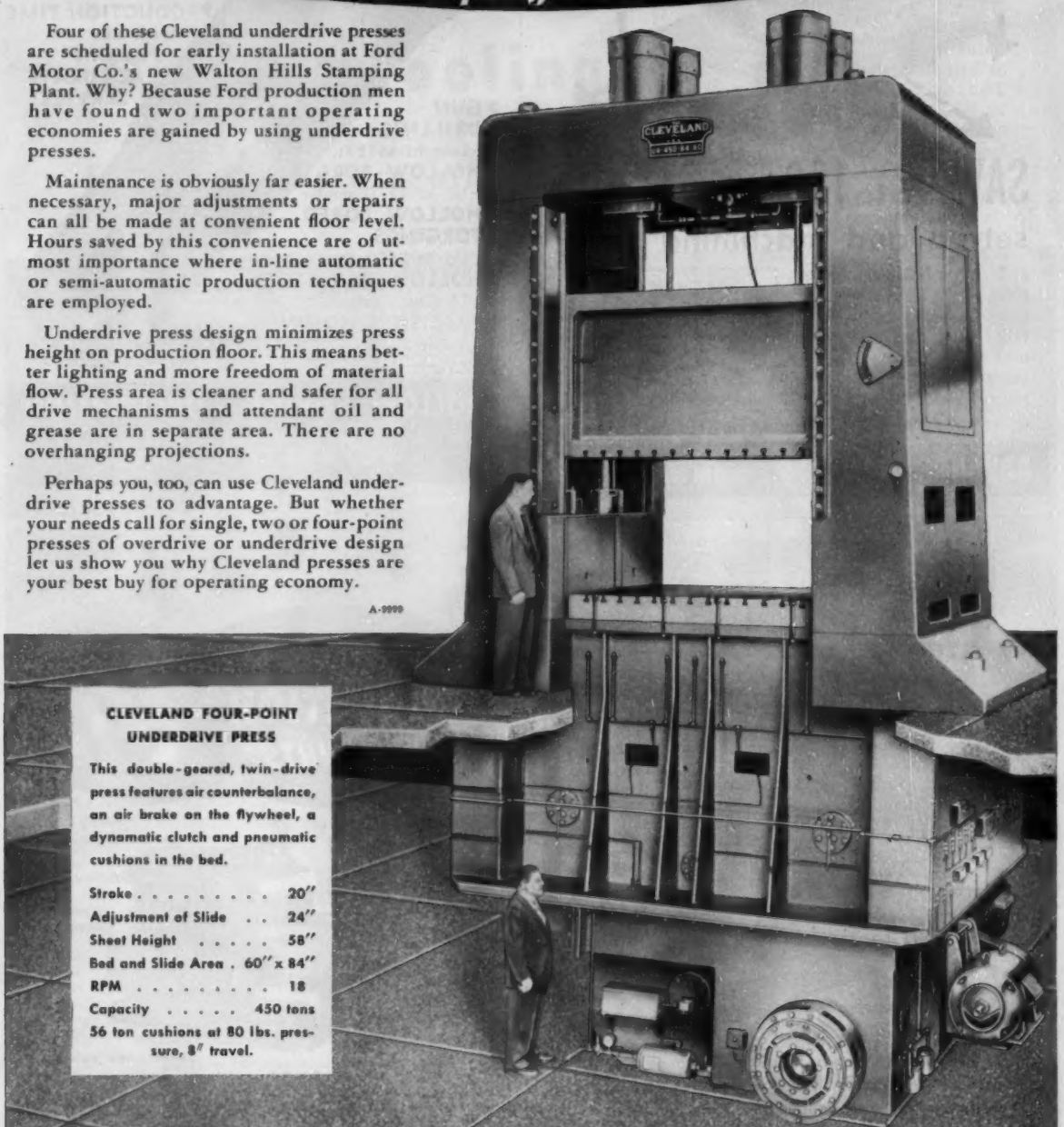

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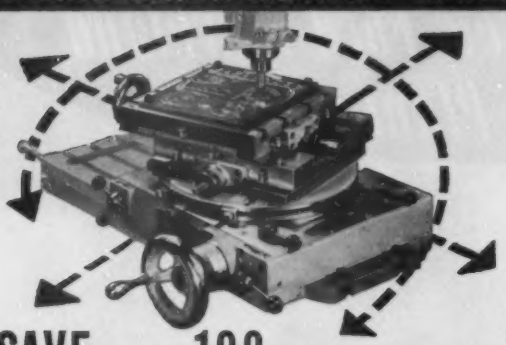

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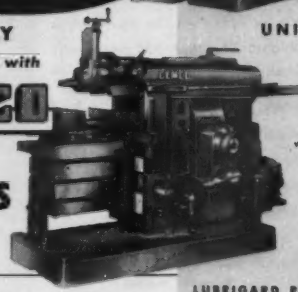

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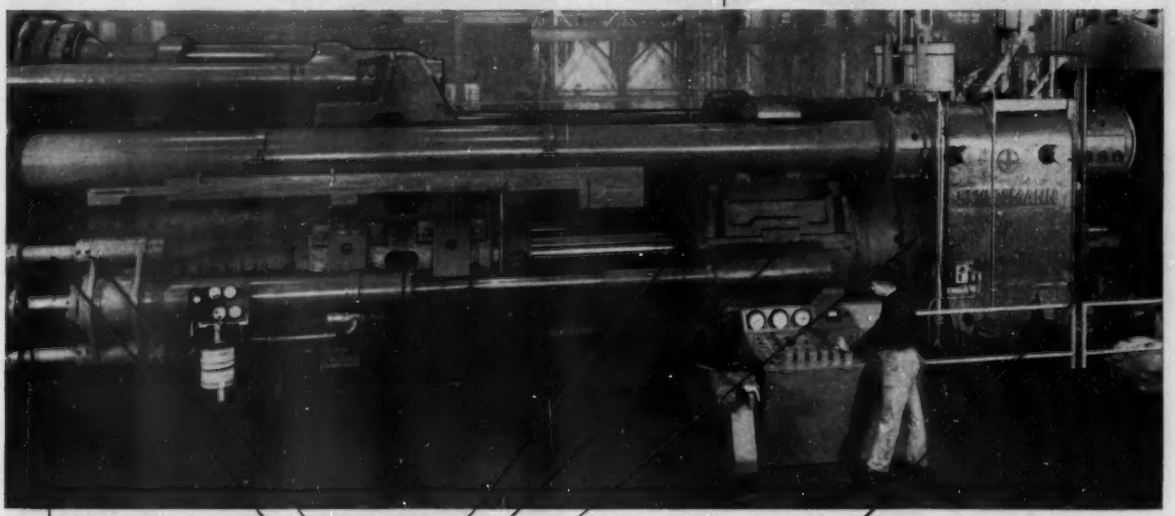

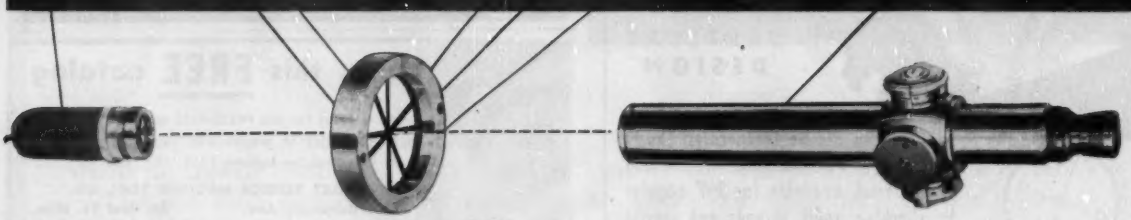

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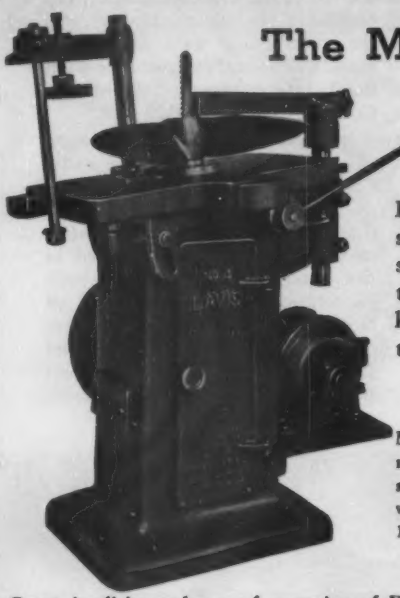


Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.

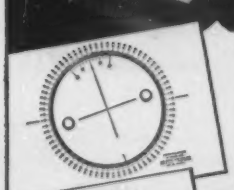
Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER, N. Y.

WILDER PROJECTOR

The MICRO-PROJECTOR with the VERTICAL DESIGN



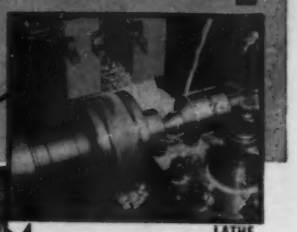
• New Gage Company Precision Plastic Comparator Charts made on non-changing, unbreakable material; available for 360° angular checking, radii, threads and special charts to your specifications. • The Wilder so equipped will inspect faster, more accurately, without the need of to-scale manually built drawings.

Economy • Accuracy • Moderate Price

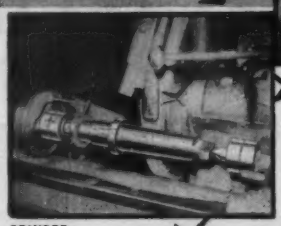
Geo. SCHERR OPTICAL TOOLS, Inc.

200 A.M. LAFAYETTE STREET • NEW YORK 12, N. Y.

If Your Problem CENTERS here TURN TO RED-E



LATHE



GRINDER

AND BE SURE!

Red-E Precision CENTERS are the answer to all your turning and grinding ACCURACY problems.

Built to take weights up to 200 tons. Speeds to 4000 RPM.

Your ONE Source

for ALL Centers — over 200 models — Standards and Specials for Lathes, Grinding, Milling, Spinning, Turret, Screw Machining, Burnishing and Gear Cutting operations.

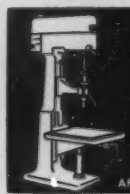
ACCURACY is GUARANTEED

Buy from your Red-E Distributor

CENTER Specialists Since 1908

READY TOOL COMPANY

548 Ironiston Ave • Bridgeport, Conn.



EDLUND

Sensitive Drilling and Tapping Machines for Economy and High Production

Capacities to 1½"

Write for latest Bulletins EDLUND MACHINERY CO.

Division Bradley-Edlund Corp.

Affiliated with Precision Castings Co. Inc. Cortland, New York

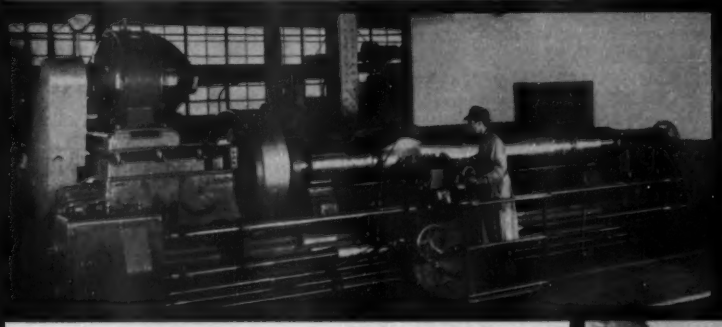
. . . this FREE catalog

Write today for this PRESS-RITE catalog showing the complete line of presses with capacities from 5 to 85 tons. Ask for bulletin P552. It's FREE!

SALES SERVICE MACHINE TOOL CO.

2347 University Ave. St. Paul 14, Minn.

"Special Purpose" machine tools



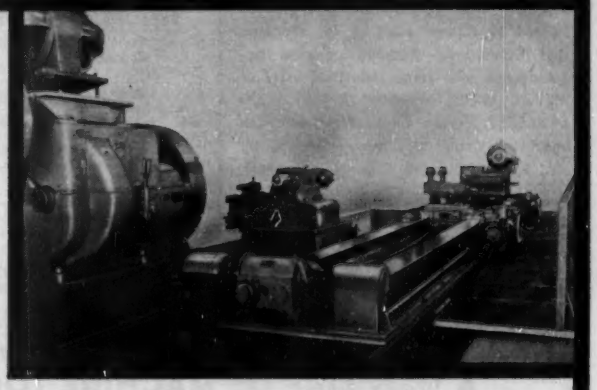
↑
36' Circular Boring Mill, designed and built by Simmons for machining the forged steel turrets of battleship guns.

←
Lathe cuts indentations in tough alloy steel rolls used to produce steel safety floor plate. Simmons designed and built the tool for a leading steel producer.

Unusual Pit Lathe was especially designed for the machining of large dryer rolls. Lathe handles rolls up to 14' diameter on 30' centers.
↓

cut your costs permanently

—take load off standard tools— eliminate machining steps and operators



Labor costs are up...profit margins slimmer. What's the answer? Just this:

More and more economy-minded managements are finding "special purpose" machine tools the one way to cut costs permanently.

Simmons Machine Tool, uniquely geared to produce the large special machine tools that other builders shy from, is currently helping America's blue-chip metalworking plants modernize and *specialize* their production lines.

Our engineers work closely with theirs, determine the problem and how it can be solved. The answer may be a completely new tool, a battery of such tools, or in the modernizing and adapting of existing tools.

If you think—or even suspect—that a "special-purpose" machine tool might do your work better, quicker and cheaper, find out. Write, wire or phone Simmons today. We'll study your problem and make a quick recommendation.

SIMMONS MACHINE TOOL CORPORATION
1759 North Broadway, Albany 1, N. Y.
New York Office: 50 E. 42nd St.

Simmons...
for the large special machine tools that others seldom build

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

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The advertising rate is $12.80 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.

NEW ADVERTISEMENTS: Address N.Y. Office, 330 W. 42 St., N.Y. 36, N.Y., for Sept. 27th issue closing Sept. 13th.

SALES MANAGER

UNUSUAL OPPORTUNITY
WITH ONE OF THE
LARGEST IMPORTERS
OF
MACHINE TOOLS & ACCESSORIES

This position offers excellent salary with rewarding percentage on all sales for sales manager with the following background: Record of volume sales in the machine tool field; long standing personal acquaintance with large industrial users of *METAL WORKING MACHINERY AND DEALERS:* Proven ability to establish aggressive dealerships throughout country . . . to organize and direct a sales staff.

Submit complete resume in confidence

BOX AM 698
221 West 41 St., N. Y. C.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNTY OFFERED

WANTED: REPRESENTATIVES & Distributors. New Mel-o-Flo Coolant Areator has huge potential in shops and with O.E.M. See our ad page 374. Melard Manufacturing Corp., 432 Austin Pl., New York 55, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $5,000 to $35,000. We offer the original personal employment service (established 44 years). Procedure of highest ethical standard is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 662 Brisbane Bldg., Buffalo 3, N. Y.

SELLING OPPORTUNITIES WANTED

MANUFACTURERS AGENT desires additional line, Central New Jersey. RA-3659, American Machinist.

SALES REPRESENTATIVE, wants to represent established manufacture full time of a product used in the machine industry. Must be already established with active accounts in New Jersey, Penna. and Conn., give full particulars. Address Representative 113 Harrow Road, Westfield, New Jersey.

WANTED

ANYTHING within reason that is wanted in the field served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

PEACOCK CORPORATION
Propane Gas Installations
and
Anhydrous Ammonia Plants
Paul E. Peacock, Jr., Pres.
Box 268 Westfield, N. J. Westfield 2-6258

MACHINE TOOL RECONDITIONING & the Art of Hand Scraping
— illustrated —
Write today for folder describing book
MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., Fourth & Wabasha Sts.
St. Paul 1, Minn.

CONTRACT WORK

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10 to 12 ft. Lengths
ALL METALS
Also special screw machine products to order
EASTERN
MACHINE SCREW
28-46 Barclay St.
New Haven, Conn.
Makers of
H & G DIE HEADS

We Want to Acquire by Purchase or License A NEW LINE OF MACHINE TOOLS

Our client—a large, long established manufacturer of high precision machinery—wants a new and distinctive product line. We shall be interested in:

1. A small or medium size machine tool, such as a jig borer, surface grinder, contour grinder, broaching machine, gear generator, etc.
2. An accessory or attachment for machine tools.

The machine, accessory or attachment must be developed to the point of commercial use. Our client is prepared to supply working capital and production facilities needed for rapid development of the business.

Please write, referring to advertisement #63. No commission to us. We are compensated by our client.

WELLING & WOODARD, INCORPORATED
Consultants in Diversification and New Products
52 VANDERBILT AVENUE NEW YORK 17, N. Y.

PATTERNS in WOOD and METAL
for All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them
GENERAL PATTERN WORKS
2233 Hack Street Cincinnati, Ohio

"SEARCHLIGHT"

IS

Opportunity Advertising

—to help you get what you want.
—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

"Think SEARCHLIGHT FIRST"

OWNER OF PATENT
on tool for grinding cams
SEEKS LICENSEE WITH SALES OUTLETS

This is a unique tool for producing a great variety of cam shapes and every job shop is a prospect. Nothing comparable now on market. Should have large sale at high profit. For particulars address

SAM TIERNEY,
Patent Department
ROHR AIRCRAFT CORPORATION
Chula Vista, California

MODERN BRITISH MANUFACTURER SOLICITS AMERICAN PRODUCTS

British medium sized engineering concern whose main products are well known in America can undertake the manufacture, under license, of complete machines up to five tons weight.

Recently installed plant consisting of large turret lathes, large and medium sized milling machines, large planing machines, drilling and cam-milling machines, horizontal and vertical boring machines.

Send drawings or prototype machine if possible.

Companies interested should write to General Manager:
JOHN JARDINE LTD.
Nottingham, England

BUY FROM STOCK
Telephone
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FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

LATHES

27"x18' MONARCH "N" Geared Head Lathe, 11' centers, Taper Attach., Full Equipment, Late Type.

24"x12' BOYE & EMMES Timken Bearing, Geared Head, Lathe. Late Type.

27"x16' NILES, BEMENT, & POND Geared Head Lathe, 9' centers, M.D.

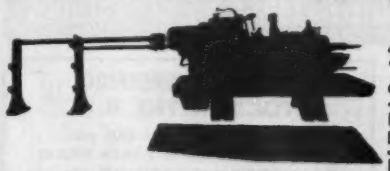
24", 36" BULLARD Vertical Turret Lathe, New Era, Turret Head, Side Head, Motor Driven.

No. 601 W.D. OSTER Motor Driven Turret Lathe, 1½" capacity, Late.

1A WARNER & SWASEY Turret Lathe, Heavy Duty, Power Chuck Wrench, Timken Bearing, M.D.

No. 2, No. 3, No. 5, No. 3A WARNER & SWASEY Geared Head Turret Lathes, Bar Feed, Motor Driven.

24"x10' AXELSON Geared Head, Heavy Duty Model "E" 28" Actual Swing, M.D. Taper Attachment.



No. 7 BARDONS & OLIVER Universal Turret Lathe, 2½" capacity. Preselector Head, Late Type.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, Motor Driven, Late type.

No. 1 LaPOINTE Motor Driven Horizontal Broach, 5 tons cap., 38" stroke.

50 HP. CHICAGO PNEUMATIC Air Compressor. Type NSB, 253 CFM, Piston Displacement.

10"x10" RACINE #30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10'x10 ga., 10'x¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

10'x10 ga. CINCINNATI Power Squaring Shear, many extra features; NEW 1948.

#7A THOMAS open back Inclinable Press 80 Ton cap. Flywheel M.D.

600 ton NILES-BEMENT-POND Motor Driven Wheel Press, 86" between strain rods, 14' cap., 17" diam. ram.

#5, #7 JOHNSON O.B.I. Presses. 56, 79 tons cap. M.D. Flywheel & Geared Type.

MILLING MACHINES

#2-18 CINCINNATI Plain Auto. Milling Machine, M.D. Late Type.

#2 KEMPSMITH Horiz. Maxi-Mill, Motor in base. Vert. Head.

#08 CINCINNATI Vert. Mill, Plain & Rotary Table Type.

#3B KEARNEY & TRECKER Vertical Milling Machine, Motor in base.

No. 0-8 CINCINNATI Rise & Fall Horiz. Mill, Late Model.

No. 3B KEARNEY & TRECKER Horiz. Mill, Double Overarm, Motor in base.

No. 2M CINCINNATI Universal Horizontal Mill, Full Equipment, M.D.

96" x 86" x 28' NEWTON PLANER TYPE MILLING MACHINE. 2 Heads on Rail; 2 Side Heads; Pendant Control; Late Type; Inspect under power.

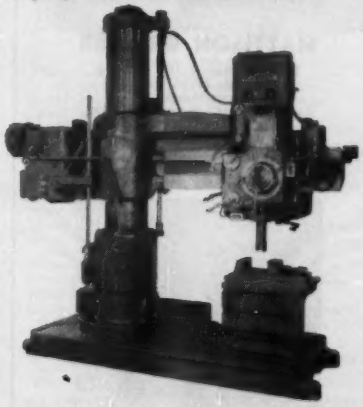
DRILLING MACHINES

4'x15" Column CINCINNATI-BICKFORD "Super-Service" Radial Drill, Motor on arm, Box table.

No. 262 BARNES Motor Driven Sliding Head Drill Press. 2" cap. in steel.

No. 2 M.T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

No. M200 DEFIANCE Prod. Drill, 2" cap., #5 M.T., 26" swing, 1942.



4' ARM, 15" COLUMN CARLTON RADIAL DRILL. 48 SPINDLE SPEEDS 15-1500 RPM. MOTOR ON ARM. 1943.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

6'x¼" VERSON Power Press Brake, 8' overall, late type.

GRINDERS

12"x36" LANDIS Universal Cylindrical Grinder, Excello Internal Spindle, M.D.

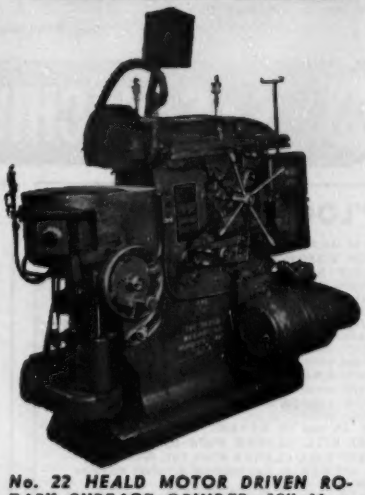
6"x18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

6"x18" NORTON Vertical Hydraulic Surface Grinder, complete with magnetic chucks, coolant systems. Late.

#TG615 JONES & LAMSON Thread Grinder, Late, M.D. and TG848.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

12"x36" MATTISON M.D. Hydraulic Surface Grinder, 15 HP Spindle Motor.



No. 22 HEALD MOTOR DRIVEN ROTARY SURFACE GRINDER. 12" Magnetic Chuck. Late Model.

20", 24", 28" GOULD & EBERHARDT V-Ram Shapers, M.D.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke. Motor Driven.

30 K.W. LEPEL High Frequency Induction Heater.

No. 8LS FELLOWS M.D. Gear Lapping Machine. With Detachable Head, Universal Work Support.

No. 20, WATERBURY FARREL Thread Roller, ⅜" cap., 1944.

15' x 10' x 36' BETTS PLANER, DOUBLE HOUSING, BOX TABLE, 2 Swivel Heads on Rail; 2 Swivel Side Heads; Pendant Control Variable Speed Main Drive Motor, 75 HP. Inspect under power.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK • SEND US YOUR INQUIRIES

FOR RENT OR SALE

AUTOMATICS	*Repl. Rent cost	per mo.
3½" 4 Spindle Cone	$27,000	$130
2⅝" 4 Spindle Cone	23,000	143
2½" Single Spindle Cleveland	17,000	80
2" 4 Spindle Cone	18,000	110
#548 ½" Cone	10,000	50
#00G Brown & Sharpe	6,250	30
BORING MILLS—Vertical		
90" Cetburn 2 Swivel Heads	55,000	350
54" Sellers w/side Head	60,000	95
42" Bullard	42,000	150
34"-44" Niles	44,000	119
36" Bullard	36,000	95
24" Bullard	24,000	58
BORING MILLS—Horizontal		
3½" Lucas	35,000	110
3" Union w/Built-in Rotary Table	32,000	230
#42 Heald Heavy Duty Borematic	30,000	139
DRILLS		
Morris 18 Vertical Spindles	25,000	130
36 Spindle Natco	16,900	58
6 Spindle Avey #2 Morse	9,000	70
#2 M.T. LMB L & G Single Spindle	2,200	20
P & W 6 Spindle Vert. Deep Hole	35,000	197
GEAR EQUIPMENT		
G & E 50" x 16 Gear Cutter	17,000	90
40" Gleason St. Bevel Generator	25,000	50
15" Gleason Spiral Bevel Roughor	21,000	40
9" Gleason Spiral Bevel Generator	20,000	70
8" Gleason Spiral Bevel Generator	16,000	68
#3 Gleason Spiral Bevel Generator	6,700	60
624A3 Fellow Spur & Helical Shaper	16,000	130
#615 Fellows Shaper	11,000	70
#725 Fellows Shaper	8,000	70
#12-B Gleason St. Bevel Roughor	16,000	130
#12 Gleason St. Bevel Finisher	19,000	150
GRINDERS—Cylindrical		
23"x36" Norton	36,000	135
14"x36" Norton	28,310	115
10"x36" Norton	19,245	99
10"x19" Norton	10,000	70
4"x12" Landis	10,200	70
16"-26"x48" Cincinnati Univ.	17,000	75

	*Repl. Rent cost	per mo.
GRINDERS—Tool & Cutter		
#13 Brown & Sharpe	$ 7,200	$ 60
#2 Norton	6,155	78
Adrian Oliver	6,000	27
GRINDERS—A—Surface B—Vertical C—Rotary		
(A) 16"x30"x48" Thompson	20,000	240
15"x72" Norton	18,000	110
12"x36" Diamond	13,000	55
8"x24" Doall	6,500	70
(B) 14"x40" Pratt & Whitney	18,000	119
6"x18" Norton	4,400	46
(C) #25A Heald 20" Chuck	14,500	119
GRINDERS—Internal		
72-A-5 Heald	20,000	99
GRINDERS—Gear		
#17 Gleason Hypoid	39,000	280
18" Gear Grind Internal & Spline	16,500	99
Maag	32,000	280
GRINDERS—Miscellaneous		
Lempco Crankshaft 36"x96"	12,000	150
Poole Roll Grinder 21½"x120"	32,000	179
LATHES		
42"x108" cc Niles Heavy Duty	48,000	430
36"x20' cc Rahn & Larmon	28,000	290
36"x90" cc Niles	37,000	139
26"x80" cc Greaves Heavy Duty	19,000	99
20"x102" cc Monarch Model M	30,000	350
18"x24" Monarch Model CBB	12,000	129
18"x48" Monarch w/shape & Keller	39,000	350
10"x20" Model EE Monarch	80,000	99
9" Sundstrand Automatic Stub	12,000	30
3D Gisholt Simplimatic	22,000	60
MILLING MACHINES—Plain & Univ.		
#3S Cincinnati High Power Plain	15,000	159
#2G Kempsmith Plain	6,000	80
MILLING MACHINES—Vertical		
Newton 27"x60" 2 Way Profiler	35,000	240
#4 Cincinnati	20,000	260

	*Repl. Rent cost	per mo.
Type E-4 Keller	$21,000	$119
Type E-3 Keller	17,000	80
#3VG Reed Prentice	10,000	95
MISCELLANEOUS		
#2606 Barnes Hone 2 Heads	17,000	150
P & W Jig Borer 18"x12"	8,000	70
#½x30" P & W 10-Spl. Gun Chamber	22,000	90
2 Spl. Profiler Hard Ways	12,000	75
12' x 10 Ga. Niagara Shear	9,000	110
#20 Reed Thread Roller	8,000	70
#5-60 Cincinnati Simplex 20"x70"	30,000	250
PLANERS		
21' Sellers Plate	40,000	170
40"x40"x12' New Haven	33,000	83
54"x48"x10' Cin. Openside	45,000	200
30"x30"x6' Cincinnati	17,000	70
PRESSES		
600 T 79½ Bliss 42"x42"... 16" str	52,000	370
135 T 56½ Cons. w/Trim & Cutoff 20"x41"	10,000	79
100 T M Anville w/Roll Feed 26"x50"	14,000	45
55 T Bliss #384 23"x17" Str. 6"	15,000	69
45 T #630 Bliss Hi Prod	16,500	70
300 T Farrel Bir. 38"x36" Str. 18"	32,000	250
RADIAL DRILLS		
10'x26" Cincinnati Bickford	34,000	300
6' Western	12,000	90
3'11" American	11,000	73
ROLLS		
#7 H and J 25'x3⅝"	90,000	300
Buffalo Angle Roll Type OAT	4,000	55
SHAPERS & SLOTTERS		
20" Bertram Time Saver	8,500	99
5" Pratt & Whitney Slotter	7,000	29
TURRET LATHES		
6.2 Denver	15,000	75
3A Warner & Swasey	23,000	150
7A 2½" Jones & Lamson	17,250	230
#4 Warner & Swasey Universal 1½"	9,500	30
#4 Midland 2" Capacity	10,500	139
#3 Warner & Swasey	9,000	110
#2 Simmons 1¼" Capacity	5,000	33

Over 2500 Machine Tools Available. Contact Mr. Jay Srybalk For Details

*Approximate

S & S MACHINERY CO. | 135 53rd St. · Brooklyn 32, N.Y. | Phone: HYacinth 2-7400 · Cable: SANDSTOOLS

"LOOK THESE OVER"

No. 45 HEALD Boromatic, Single End, Two Spindle
12x30" MONARCH Geared Head Lathes
22"x336" MONARCH Mode "HH" Lathe, Two Carriages, M.D. actual swing 27.5"
24"x12' Centers BOYE & EMMES Hvy Duty Engine Lathe
30"x10' bed AMERICAN High Duty Geared Head Lathe
38"x17' centers AMERICAN Heavy Duty Geared Head Lathe, 1941
42"x13' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
60"x18' LeBLOND Heavy Duty Geared Head Lathe New 1952
Nos. 5A and 5Y BRYANT Internal Grinders
10x36 HILL CLARKE Plain Cylindrical Grinder
10"x96" HILL CLARKE Plain Cyl. Grinder
No. 172 HEALD Gap Internal Grinding Machine for large swing
16"x72" LANDIS Type C Hydraulic Plain Grinder —1942
24"x276" LANDIS Type B Hydraulic Pl. Grinder
Nos. 4D and 6B POTTER & JOHNSTON Automatic Lathes
IL GISHOLT Universal Turret Lathe, 1946
No. 8A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes
No. 2 CINCINNATI HS Dial Type Plain Millers
No. 0-6 CINCINNATI Plain Milling Machines.
No. 2M CINCINNATI Vertical Miller 1941
FITCHBURG Plain Horizontal Mfg. Type Milling Machine, 24"x72" table
No. 1-16 CINCINNATI Plain Mfg. Miller
No. 3B BROWN & SHARPE Dual Control Plain Miller
No. 5 CINCINNATI High Power Plain Miller with motorized overarm
3'11" CARLTON Radial Drill motor-on-arm
CINCINNATI BICKFORD Precision Drilling Machine with Bullard Man-au-Trol Table
E-5 & 2AL NATCO Multiple Spindle Drilling Machine
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver, 1943
No. 36BM GOULD & EBERHARDT Gear Roughor
36" OHIO "DREADNAUGHT" H.D. Shaper
100" BETTS Vertical Boring Mill, 2 heads
No. 420 BARNES Two-Spindle Deep Hole Drilling Machine

WIGGLESWORTH INDUSTRIAL CORPORATION
203 Bent St. Cambridge 41, Mass.

UNUSUAL SURPLUS

MATTISON GRINDER
Bed: 30" wide x 16-Foot long
Wheel: 20"x6"x10"
Capacity Height 24"
Four 30" x 48" Magnetic Chucks
D.C. Generator, Rheostat
Weight: 59,000 lbs.
Condition: Perfect

BARGAINS

CINCINNATI CENTERLESS GRINDER
Model No. 2
Serial No. H-2004-X
½" to 4" capacity
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Coolant Pump and Tank
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#1 M. & M. Saw Sharpener
#12 Van Norman Miller
DIVINE Buffing Lathes
#10 W.F.F. Thread Roller
BILLINGS & SPENCER Di-matic
BROWN & SHARPE Automatics, several
P & W Contour Cutter Grinders
#12 B. & S. Prod. Miller
#40 LEES BRADNER Thread Millers
#48W BPT. Abrasive Cut-off
#12 MARTIN Marking Machines
#72 ETNA Swager
Numerous Other Machine Tools

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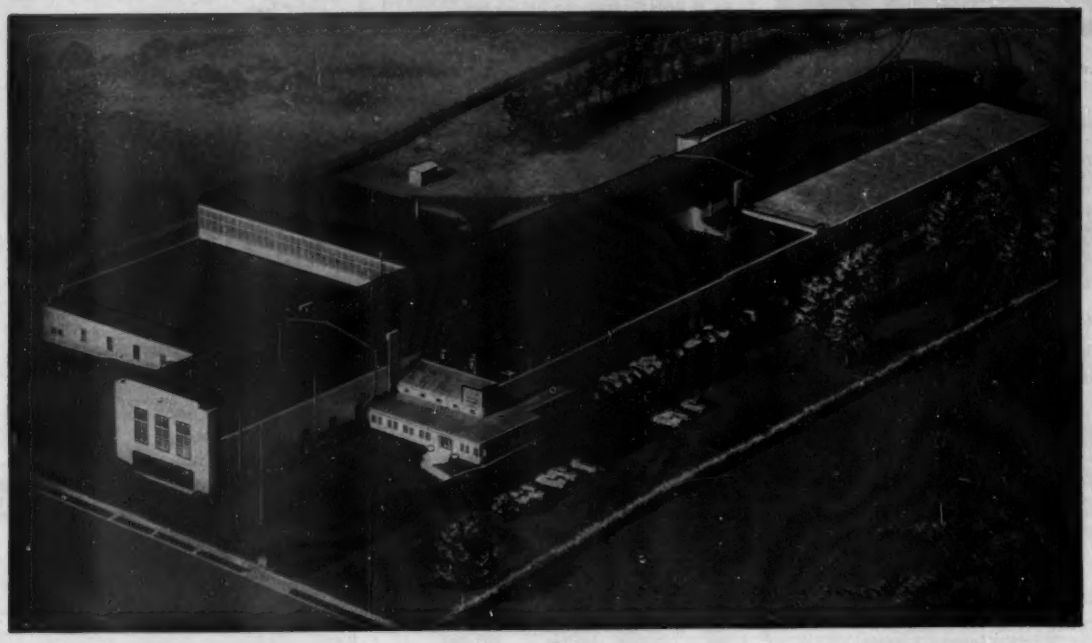

ENGINE LATHES

Gema "Copytor" Duplicating Attachment, m.d.
Model TR 50 Hardinge High Speed Production Lathe, m.d.
12"x6' Lodge & Shipley Geared Head, m.d., taper
12"x84" centers Lodge & Shipley Geared Head, m.d., taper
14"x61½" centers Americana Geared Head, m.d.
14"x30" centers Bradford Lathe, Timken
14"x6' American High Duty Geared Head, m.d., taper
14"x6' Hendey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' LeBlond, Geared Head, s.p.d.
14"x6' bed Monarch, cone, motorized
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Sidney Geared Head, m.d.
14"x8' Prentice, m.d., taper
16"x30" centers Monarch, m.d., taper
16"x6' bed Cisco Geared Head, m.d.
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lehmann Geared Head, m.d.
16"x6' Lodge & Shipley Selective Head, m.d.
16"x6' bed Monarch Geared Head, m.d.
16"x8' Monarch, cone, motorized
16"x12' bed LeBlond Geared Head, m.d., taper
16"x14' Monarch, m.d., taper
17"x6' LeBlond Geared Head, m.d.
18"x5' LeBlond Geared Head, m.d.
18"x6'6" bed Greaves-Klusman Geared Head, m.d.
18"x96" centers Sidney, m.d., timken, late
18"x7' Hendey Geared Head, m.d., taper
18"x8' bed American Geared Head, m.d.
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley Geared Head, m.d.
18"x8' Whitcomb-Blaisdell Geared Head, s.p.d.
18"x8'6" bed Walcott, cone, motorized
18"x10'6" bed Boye & Emmes, cone, motorized
19"x4' centers LeBlond, H.D., m.d.
19"x6' bed LeBlond Geared Head, m.d., later type
19"x10' bed LeBlond Geared Head, m.d.
19"x16' bed LeBlond Geared Head, m.d.
20"x8' bed Cisco, cone, motorized
20"x8' bed Greaves Klusman Geared Head, m.d. in log
20"x8' bed Boye & Emmes, m.d.
20"x8' bed Lodge & Shipley Geared Head, m.d., taper, late type
20"x10' Sidney Geared Head, m.d.
20"-40"x9' bed Rahn-Larmon Gap Lathe, cone, motorized
20"x10'6" Boye & Emmes, cone, motorized
20"x10'6" bed Sidney "Tritrol" Geared Head, m.d., late
21"x8' bed LeBlond Geared Head, m.d., taper
23"x12' bed LeBlond, cone, motorized
24"x12' LeBlond Geared Head, m.d., taper
24"x12' bed Boye & Emmes, belt drive
24"x12' Bridgeford Geared Head, m.d., taper
24"x13' bed Lehmann Geared Head, m.d., taper
24"x16' bed Lodge & Shipley, cone, motorized
24" Raised to swing 32"x22' bed—16' centers New Haven, cone, taper
25"x10' bed LeBlond Geared Head, m.d., taper
30"x10' bed Betts-Bridgeford, m.d.
30"x12'6" bed Niles-Bement-Pond, variable speed m.d., taper
30"x13'6" bed Niles-Bement-Pond, m.d.
30"x18' LeBlond Geared Head, m.d., 8'10" centers
30"x40' bed (33' centers) Betts-Bridgeford Heavy Duty Hollow Spindle "Oil Country" type, m.d.
36"x84" centers American "Super-Productive", m.d.
36"x16'6" bed Boye & Emmes Geared Head, m.d.
36"x18' Putnam, m.d.
38"x17' centers American Super-Productive Geared Head, m.d.
40" raised to 48½x108" centers LeBlond, m.d.
42" raised to swing 56"x20' bed Lodge & Shipley, m.d.
42"x14' bed American Geared Head, m.d.
42" Putnam raised to swing 56½x20' bed Geared Head, m.d., 11'6" centers
48"x33' centers Niles-Bement-Pond, m.d.
63"x7' centers J. H. Johnson, m.d.
72"x7' centers J. H. Johnson, m.d.

MANUFACTURING LATHES

12x18" Reid Small Piece Production Lathe, Model 6WSL, m.d.
No. 3 Lodge & Shipley Duomatic, m.d., late type
No. 3A Lodge & Shipley Duomatic, m.d., late type
No. 3 Niles-Bement-Pond Axle Lathe, m.d.
Model B1 Blount Speed Lathe, m.d.
W. C. Lipe Carbo Semi-Automatic, m.d., late
W. C. Lipe Carbomatic, m.d.
Colborne Mfg. Bench Type Speed Lathe, m.d.
No. 4 LeBlond Boring Lathe, 37' bed, 4" hole, m.d., latest
No. 9, 12 LeBlond Multi-Cut, m.d.
4x60" LeSwing, m.d.
8x108" LeSwing, m.d., taper, latest
8x132" LeSwing, m.d., latest
9x12" Sundstrand, s.p.d.
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
Schaer Type NA 2B Speed Lathe, m.d., latest
36"x10' LeBlond Turning Lathe, cone
No. 12 Gisholt Semi-Special Automatic Production, m.d.

HAND MILLING MACHINE

Van Norman, m.d., latest

PLAIN MILLING MACHINES

No. 1B Milwaukee, m.d.
No. 1½ Brown & Sharpe Plain, cone, motorized
No. 2 Rockford, m.d.
No. 4 Ohio, cone
No. 3 Standard Plain Type Milwaukee, m.d.
No. 3B Milwaukee, m.d.
No. 3B Brown & Sharpe, m.d.
No. 36 Van Norman Plain Miller

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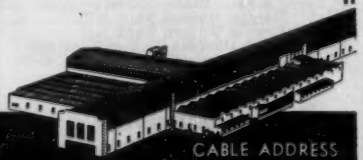

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AUTOMATICS
1-1/16" Cleveland Model A (1942).

BORING MACHINES
No. DB2112 Excello Single End Borer.
100" Niles-B-Pond Vert. Bor. Mill.

DRILLS
No. 2 Avey Cam Fd. Drill. 14" Swing.
No. 2 MA-6 Avey 24"-1-Spdl.
2 Spdl.—24" SW.—No. 3 Avey.
No. K60H Fox 16 Spdl. Multi Drill.
No. 2—20" 2-Spdl. Leland-Gifford LM6
No. LBM—20" 3 Spdl Leland-Gifford Drill.

GEAR MACHINES
11" Gleason Gear Generator.
No. 12HS Gould & Eberhardt.
No. 36-BM G. & E.—3 spdl. Rougher.
615-A Fellows Gear Shaper.
612-A Fellows Gear Shaper.

GRINDERS
No. 214 Besley Double End Disc Gdr.
5"x30" Cam-o-matic (1946).
6"x18" Norton Type C Plain (1943).
10"x36" Norton Type C Grinder.
10"x36" Norton Type C Cam Grinder.
10"x48" Norton Type C Pl. (1943).
No. 4 Cinn. Hi-Speed Dial Type Pl. (1944)
TG 615 J & L Thrd Gdr.
B24-28" Chuck Arter Surf.
No. 5 Bryant Internal Grinder.
No. 5B Bryant Internal Grdr.
No. 16-16 Bryant Int. Grinder.
No. 16-28 Bryant Int. Grinder.
No. 16 A-28 Bryant Internal Grinder.
No. 16-38 Bryant Int. Gdr.
No. 24-26 Bryant Int. Grinder.
No. 24-36 Bryant Internal Grinder.
No. 24L—36 Bryant Hyd. Internal Gdr.
No. 81 Heald Internal Centerless.

HILL-CLARKE NORTON TYPE MOTOR DRIVEN GRINDERS
10"x36" Centers. 14"x36" Centers.
10"x72" Centers. 14"x50" Centers.
10"x96" Centers. 14"x72" Centers.
18"x96" Centers. 14"x96" Centers.
18"-30" gap x 96" Centers.
18"x120" Centers

HONES
Model H-2 Micromatic Horiz. Hone.
Model 200-HS-Dbl. End Micro. Horiz.
Model H-7 Micromatic Vert. Hone
No. 224 Barnes Vert. Hone
No. 306-H Barnes Vert. Hone.

LATHES
R-14 Seneca Falls Lo-Swing Lathe. (16"x32")
12"x21" Fay Auto.
12"x36" Fay Auto.
18"x6' Am. Geared Head Lathe.
27"x12' American Geared Hd. Lathe.
36"x18' Putnam Grd. Hd. M.D.
No. 2 Warner & Swasey Geared Head Tur.
No. 3 Warner & Swasey Bar Feed Turret.
No. 5W Acme Tur. Lathe (Late).
No. 3AL Gisholt, Cross-Slide Turret.
No. 4A Warner & Swasey Turret.
No. 6 Warner & Swasey, cone head, Turret.
2¼"x24" Jones & Lamson, turret.
3H-10 Libby International, 29" Sw.
18" Libby, M.D., turret.
No. 4A Warner & Swasey (1944).

PLANERS
48"x36"x14' Gray, 2 Heads.
48"x48"x12' Cincinnati, 2 Heads.
60"x48"x27' American, 4 Heads.

MILLING MACHINES
No. 3K Kearney & Trecker Vert.
No. 08 Cincinnati Vert. (1942).
4" Taylor & Fenn Duplex Spline.
10"x48" Hanson-Whitney Thrd. Mill.
10"x60" Pratt & Whitney Thrd. Mill.
12"x102" Mod. HT Lees Bradner Thrd. Mill.
54"x30"x16' Ingersoll Slab Mill.

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LATE MODEL GUARANTEED MACHINE TOOLS

BORING MACHINERY
3¾" Bar No. 32 Lucas, horizontal, table type
3" Rockford horizontal, fixed table (2)
36" Rogers vert. T/L, side head, new 1942
36" Bullard vert. T/L, side head, #11325
72" Niles Bement Pond 2 heads, PRT, #17623
No. 48 Heald Boromatic precision late type
No. DB216 Excello 6 spdl, D/E borer, late

DRILLS, RADIAL
3½ ft. arm 8" column American sensitive
4 ft. arm 13" column Carlton, MIB, late type
8 ft. arm 16" column American, late type.

GEAR HOBBERS
No. 12H Gould & Eberhardt universal
No. 36H Gould & Eberhardt universal
72" Schmehardt & Schutte universal

GEAR MACHINERY, MISC.
8" Red Ring shaver, with crowning, 1943
10" Pratt & Whitney hyd. gear grinder, 1944
12" Model 224 Illinois Involute profile measuring machine, new 1943
13" Model Sheffield gear chamferer, 1947
No. 5 Barber Colman auto. hob sharpener, 1944
Nos. 71A, 75A, 712 and 715 Fellows NS shapers.

GRINDERS, CYLINDRICAL
4"x18" Cincinnati pl. hyd., plunge cut, 1946
10"x18" Norton types BA, A C, late models
10"x16" Cincinnati Cimatic, type ER (2), 1941-1948
10"x36" Norton type C semi-auto., hyd. infeed
16"x36" Norton type C hydraulic (2), 1943
No. 13 Brown & Sharpe universal tool, 1942.
14"x36" Landis type C, hydraulic (2), 1946
16"x36" Norton type C, hydraulic (2), 1943
16"x60" Landis self-contained serial 11122
16"/26"x72" Norton type C, hydraulic, 1945
16"/40"x120" Landis gap type, hydraulic, serial 16193
16"/48"x96" Landis gap type hydraulic, new 1941

GRINDERS, SURFACE
16A2 Blanchard rotary surface, serial 6646, new 1946.
6"x18" Norton horizontal spindle, hydraulic, serial N165.
6"x12" Norton vert. spdl. hydraulic, 1942
8"x22" No. 3 Abrasive, meter in base (2), 1941
12"x48" Model 300 Hanchett vert. spdl. 1946
14"x36" Pratt & Whitney vertical surface grinder, 1942.
72" No. 72 Hanchett rotary surface, 1946

GRINDERS, MISC.
No. 2 Cincinnati cutter grinder, late model
30" Ingersoll cutter grinder, late model

INTERNAL GRINDERS:
Nos. 72, 72A3 and 72A5 Heald
No. 5 Bryant semi-automatic chucking
No. 2 Cincinnati centerless (3), 1942-1943
No. 49 Van Norman radius, 1945

LATHES, ENGINE
14"/28"x36" centers Smith-Drum, gap, 1945.
32"x12' bed Axelson toolroom, serial 2578, new 1945.
14"x42" Hendey G.H., M.I.B., 1940
16"x96" Cleco G.H., 12 speed, swings 20"
24"x14 ft. bed American G.H., Q.C.G., serial 44070
52"x30 ft. bed Niles Bement Pond G.H., like new

LATHES, MFG. & MISC. & TURRET
8"x21" Sundstrand Mfg. lathe, serial 88-1234, 1945
14"x13 ft. bed Betts Bridgeford axle lathe
14"x18" Lipe H. S. Carbo-lathe, 1943
17"x72" LeBlond Rapid production (5), 1946-1947
No. H5 Libby International saddle type universal turret lathe, 1940
No. 5 Jones & Lamson Universal ram type turret lathes, (2) late models

MILLING MACHINES
1-12 Cincinnati production miller
No. 4-38 and 4-48 Cincinnati Hydromatic production
No. 2 Cincinnati high speed dial type plain
No. 2B and 3K Milwaukee universal
No. 3B and 5K Milwaukee universal
No. 5B and 4K Kearney & Trecker plain, late type
No. 22L Van Norman universal, 1943
12", 18", 24" Cincinnati plain manufacturing
No. 4 Becker heavy duty vertical
24"x24"x12 ft. Ingersoll adj. rail planer type mill, traser controlled, 1945
30"x21"x12 ft. Ingersoll fixed rail planer type mill
42"x42"x18 ft. Ingersoll adj. rail double housing mill, 2 S.H. and 1 R.H. power on rail and head
42" Ingersoll 5 spindle rotary continuous mill
42" Ingersoll 2 spindle rotary continuous mill
48"x29"x20 ft. Ingersoll fixed rail double faced planer type mill
60"x48"x16 ft. Ingersoll adj. rail double housing planer type mill, 2 S.H. and 2 R.H.
72" swing 64" table Ingersoll 2 spindle rotary continuous mill, timken bearings.

PRESSES
106 Ton No. 93C Toledo SS, DC, air cushion.
250-ton EG53 Ferracute Knuckle Joint coining
800 Ton Cleveland Knuckle-Joint coining, serial 5745, new 1947.
2 to 70 ton Ferracute punching (several)
3 to 60 ton O.B.I., most every make
100 ton No. 30-D-36 Cleveland DC, steel frame, 1940
300 ton No. 1042 Verson, steel frame, air clutch, late model

SHAPERS & SLOTTERS
18" American heavy pattern auto-sliod. F.M.D.
32" Gould & Eberhardt Invincible, F.M.D.
36" Rockford vert. hyd. slotter, 1942

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American 20"x8' Grd. Hd. Lathe meter in base
Landis 20"x72" and 16"x96" Plain Ext. Grinder
Hanchett 25 H.P. Sg. Vert. Hydr. Surf. Grinder 12"x48" table.
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.G.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Rod Head Sp.
LeBlond 27"x12' Bed Grd. Hd. Q.C.G. Lathe 15' hollow spindle.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf Grinder 20" chuck.
Campbell No. 213 abrasive cut off 1944.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cent. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Springfield Planer Type Surf. Grinder.
P & J #2 Auto. Prod. Miller, 2 Tables.
Foote-Burt #25 Box. Col. 1-Sp. Hvy. Drill.
L & N 8', 10' & 12' Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 20" stroke open-side Shaper Planer.

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72" King, P.R.T., M.D.
100" & 72" N.B.P., 2 hds., M.D.
3" Bar Universal, Late, 1200 r.p.m.
3½" bar Defiance, Table (2)
4½" bar Sellers Floor Type
8" Bar Niles, Floor type
RADIAL DRILLS, 5'15" col. Amer., Motor-on-Arm
GRINDER, 16"x96" Landis Hyd., Late
GEAR SHAPERS, Nos. 645A3, 61A & 81 Fellows
LATHES, 50"x30" Bed Niles, Late, Wet Hd. 14"x60" con. Amer. T.A.
SLOTTERS, 20"x24" & 12" Dill-Lobdells
36" Rockard Hyd. 1942

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1941-1954 MACHINE TOOLS

CUTTER & TOOL GRINDERS
FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit

DRILLING MACHINES
ALLEN: No. 2 Drill—6 Spindle, 8" overhang
ALLEN: #½ High Speed 15"
BARNES: No. 210, 2-spindle, 21" Swing
PRATT & WHITNEY: ½B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
RADIAL DRILLS: Archdale, 5', 6' & 7', new

GEAR MACHINERY
FELLOWS: 6IA & 64A Shaper, 18" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)
INTERNAL GEAR GRINDER, GG-31

GEAR TESTERS
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 3 Bevel Gear Tester
GLEASON No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GEAR HOBBERS
CLEVELAND: #130 & 140 Rigidhobbers
REINECKER 60"
BROWN & SHARPE No. 44 20" cap.
SCHUCHARDT & SCHUTTE, 36" cap.
LEES BRADNER 49A

GRINDERS—CYLINDRICAL
BROWN & SHARPE: No. 10 cap. 6"x18" plain
CINCINNATI: 6"x18" Hydraulic, Plain
LANDIS: 16"x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 12"x18" Type C, Universal
NORTON: 10"x36", 30 Deg. Angle Wheel
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE
GEAR GRIND MACH.: GG-19, 10"x24" Hydr. Spur Gears and Spines
GLEASON: #17, 23½" P.D.
PRATT & WHITNEY: 10" single and double
INTERNAL GEAR GRINDER, GG-31 wheel, hydraulic feed

GRINDERS—INTERNAL
BRYANT: No. 5, 5Y, 16-6, 16-CP-16, 16-28, 24-L-36
HEALD: #50 Planetary
HEALD: #72A3 Sizematic
HEALD: #72A3 & #72A5 Extended Bridge

GRINDERS—RADIUS
VAN NORMAN: #73, capacity 7⅛"
VAN NORMAN: #649-16, cap. 6" to 16" dia.
VAN NORMAN: #3½" Un. Radius

HONING MACHINES
BARNES: Model 224, 4" dia. x 16" stroke
BARNES: Model 172, 2" dia. x 6" stroke
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES—PRODUCTION
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
POTTER — JOHNSTON: #4D Auto Turret

LATHES—TURRET
BULLARD: 36" Vertical turret
WARNER & SWASEY: #1A, #2A, #3, #3A, #4, #4A & #5
HERBERT: #0, #2, #4, #7, #8 and #9B/30 Sizes, new

LATHES—TURRET—continued
WEBSTER & BENNETT: Vert. 36" & 48" (New)

MILLING MACHINES
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUTT-OFF MACHINES
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
MARVEL: No. 6A Hacksaw, 6"x6"

THREAD MILLERS & TAPPERS
HALL PLANETARY: Mod "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity.
NATCO: 16 spindle Tapper ⅝" cap.

MISCELLANEOUS
GARDNER: Model 84A Double Disc Grinder, 23" Wheel
MOLDING MACHINES, ROLLER JOLT: Osborne Model 2047-3
AUTOMATIC SCREW MACHINE, Wickman Single Spindle, 7/16" New
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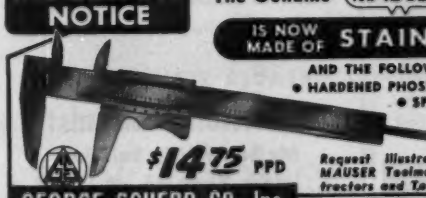

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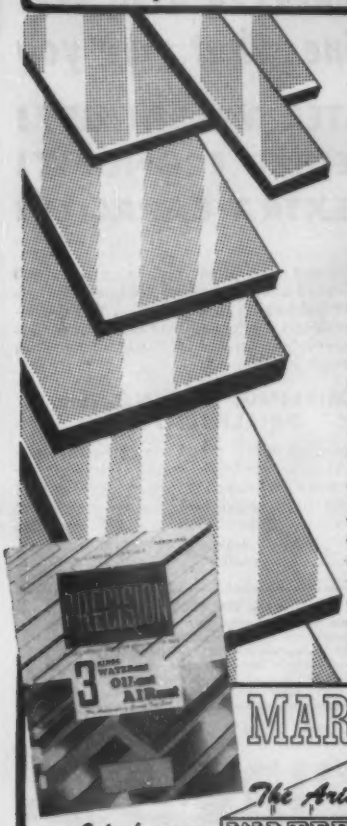

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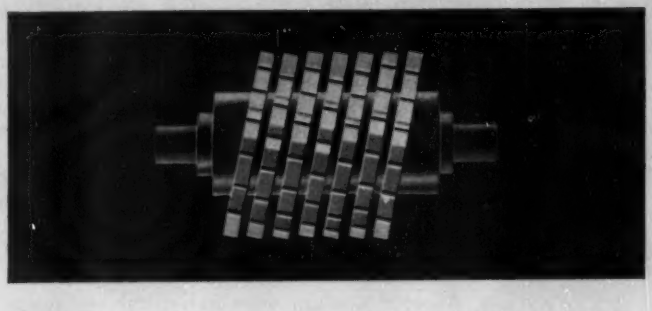

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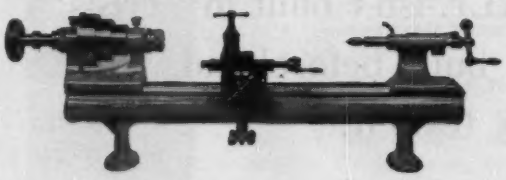

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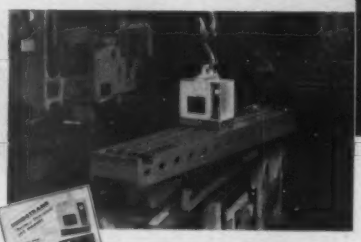

Left, milling machine table being lowered into position on machine base.

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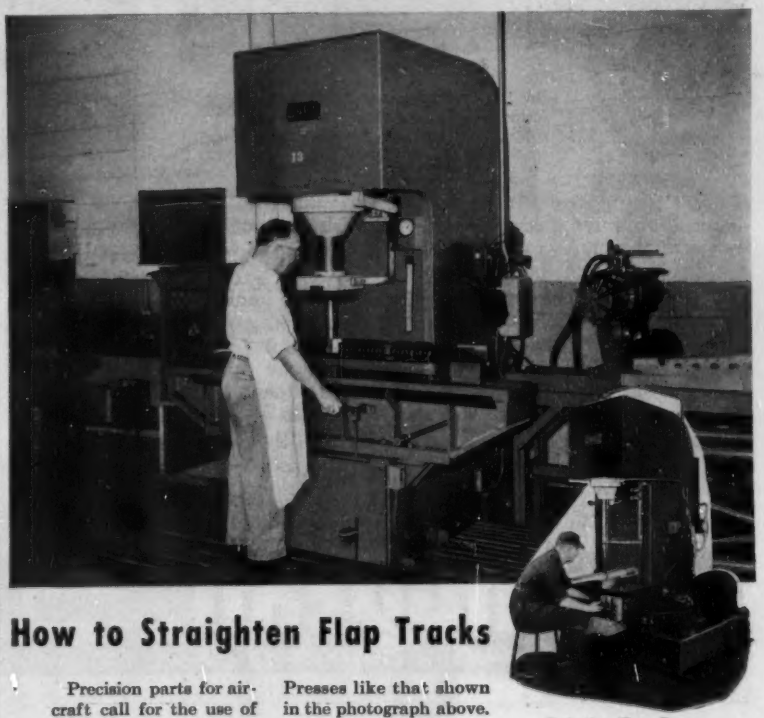

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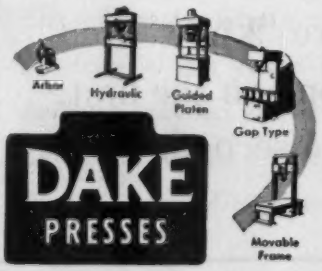

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TYPE QDB

Gerotor's NEW QDB series of small capacity pumps . . . the last word in precision engineering.

DELIVERY G.P.M. — 1800 R.P.M.					
TYPE	DISCHARGE PRESSURE P.S.I.				
	0	250	500	750	1000
QDB .4	.42	.40	.38	.35	.31
QDB .75	.84	.80	.78	.73	.66
QDB 1.5	1.67	1.62	1.57	1.50	1.42

Selection Data

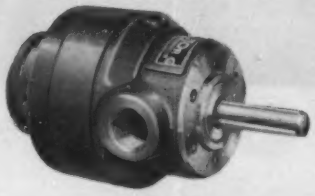
HORSEPOWER REQUIRED — 1800 R.P.M.					
TYPE	DISCHARGE PRESSURE P.S.I.				
	0	250	500	750	1000
QDB .4	.08	.16	.24	.33	.41
QDB .75	.13	.27	.41	.56	.71
QDB 1.5	.16	.42	.70	1.00	1.28

PRESSURE—Maximum continuous operating pressure is 1000 p.s.i.

SPEED—Standard design speed is 1800 r.p.m. Specific recommendations are made for applications at other speeds.

ROTATION—Standard rotation is clockwise facing shaft end. Counter-clockwise rotation is available.

OIL—Hydraulic oils with viscosity of approximately 300 s.s.u. at 100° F. are recommended.



TYPE QDH

The QDH . . . popular intermediate size of the Gerotor line

DELIVERY — G.P.M. AT 1200 R.P.M.							
TYPE	DISCHARGE PRESSURE P.S.I.						
	0	250	500	750	1000	1200	1500
QDH 3	3.3	3.2	3.1	3.0	2.9	2.7	2.5
QDH 5	5.6	5.4	5.3	5.2	5.1	4.8	4.4
QDH 8	8.6	8.5	8.4	8.3	8.2	8.1	7.8
QDH 12	12.9	12.8	12.7	12.5	12.3	12.2	11.8

Selection Data

HORSEPOWER REQUIRED AT 1200 R.P.M.							
TYPE	DISCHARGE PRESSURE P.S.I.						
	0	250	500	750	1000	1200	1500
QDH 3	.25	.7	1.2	1.6	2.1	2.5	3.4
QDH 5	.33	1.1	1.8	2.5	3.2	3.7	4.6
QDH 8	.4	1.5	2.7	4.2	5.4	6.3	7.9
QDH 12	.5	2.3	4.2	6.1	8.0	9.6	11.7

PRESSURE—Maximum continuous operating pressure is 1200 p.s.i., maximum intermittent 1500 p.s.i.

SPEED—Standard design speed is 1200 r.p.m. Specific recommendations are made for applications at other speeds.

ROTATION—Standard rotation is clockwise facing shaft end. Counter-clockwise rotation is also available.

OIL—Hydraulic oils with viscosity of approximately 300 s.s.u. at 100° F. are recommended.

TYPE O

Gerotor Series O . . . when larger capacities are needed

DELIVERY — G.P.M. AT 1200 R.P.M.					
TYPE	DISCHARGE PRESSURE P.S.I.				
	0	250	500	750	1000
O-20	20.0	19.5	18.8	18.0	17.2
O-25	25.0	24.5	24.0	23.2	22.2
O-30	31.2	31.0	30.5	29.8	29.0
O-40	43.0	42.5	42.0	41.5	40.0

Selection Data

HORSEPOWER REQUIRED AT 1200 R.P.M.					
TYPE	DISCHARGE PRESSURE P.S.I.				
	0	250	500	750	1000
O-20	1.0	4.0	7.2	10.5	13.5
O-25	1.5	5.0	8.6	12.0	15.6
O-30	2.0	6.5	10.9	15.5	19.5
O-40	3.0	9.0	15.0	21.0	27.5

PRESSURE—Maximum continuous operating pressure is 1000 p.s.i., except type O-40, which is recommended for only intermittent duty at 1000 p.s.i.

SPEED—Standard design speed is 1200 r.p.m. Specific recommendations are made for applications at other speeds.

ROTATION—Standard rotation is clockwise facing shaft end. Counter-clockwise rotation is available.

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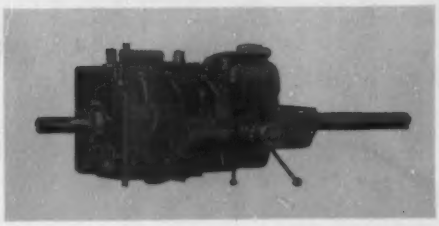
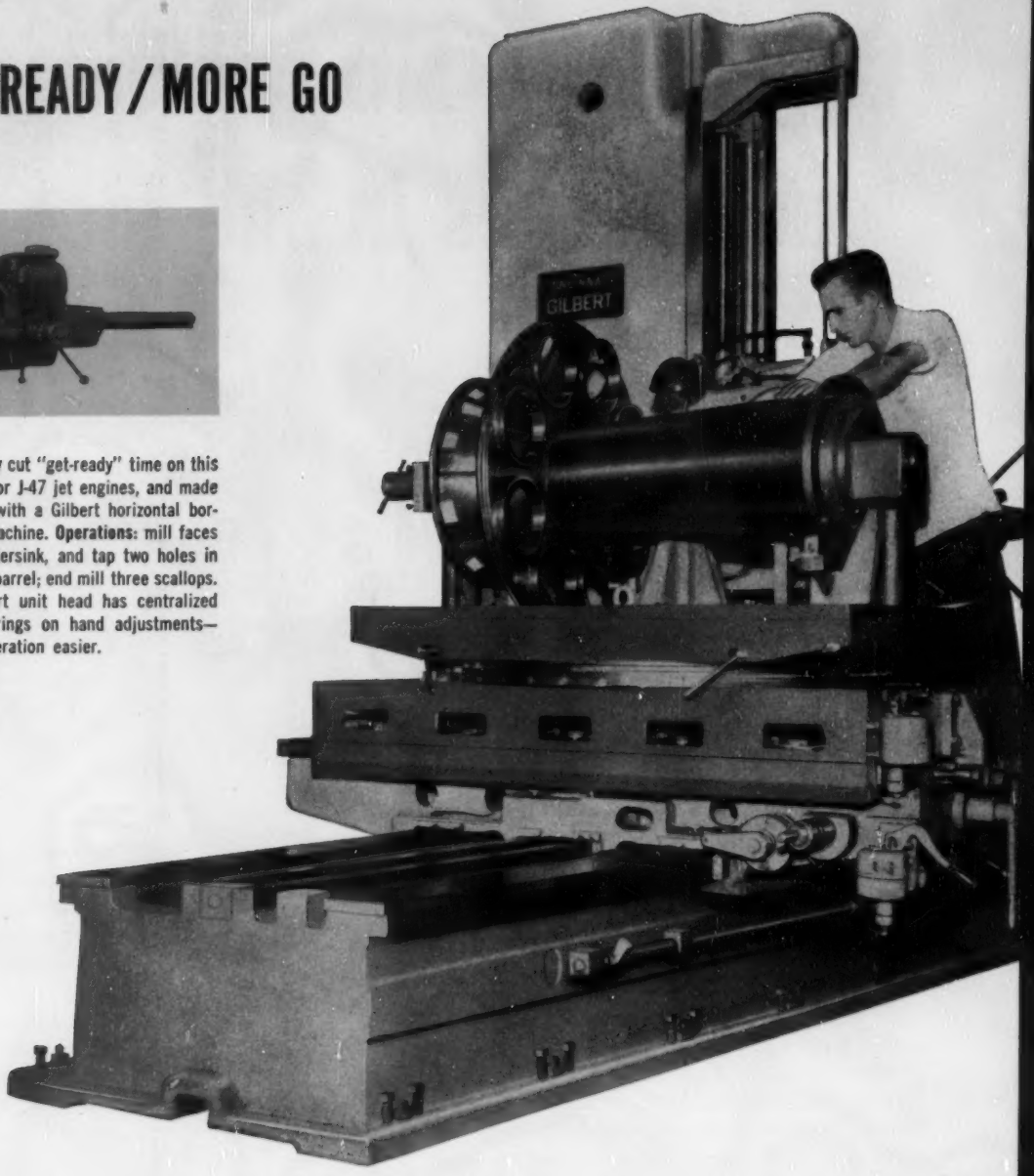
LESS GET-READY / MORE GO



Ryan Aeronautical Company cut "get-ready" time on this stainless steel aft frame for J-47 jet engines, and made "go" time produce more with a Gilbert horizontal boring, drilling, and milling machine. **Operations:** mill faces of lifting pad; drill, countersink, and tap two holes in pad; drill hole in aft frame barrel; end mill three scallops. **Time:** 105 minutes. Gilbert unit head has centralized controls, anti-friction bearings on hand adjustments—makes indexing faster, operation easier.



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Free graphite and diamond-hard carbides in the structure of Graph-Mo tool steel give it unusual life. Reports from dozens of users show that Graph-Mo steel outwears other tool steels 3 to 1. And because the graphitic particles act as a "built-in" lubricant, Graph-Mo steel machines 30% faster than other tool steels.

This Graph-Mo tool steel master plug gage showed less than 10 millionths of an inch change during 12-year test period.

Tests prove that Graph-Mo steel is the most stable gage steel made. For instance, after a 12-year period a typical Graph-Mo steel master plug gage showed less than 10 millionths of an inch change from its original dimensions.

Graph-Mo steel also has minimum tendency to pick up, scuff or gall and gives excellent resistance to abrasion. Tests on Amsler wear machine prove that Graph-Mo steel has twice the resistance to galling when compared with ordinary tool steels.

The difference between Graph-Mo tool steel and other tool steels is so real you can see it—tiny, scattered parallel marks that show the free graphite in its structure.

Insist on this "graphitic look" the next time you buy gages or tool steel. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING